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STUDY OF PATIENTS WITH HIP ARTHROPLASTY AT MASSACHUSETTS GENERAL HOSPITAL

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The late results of mold arthroplasty for disease of the hip were studied in 171 patients who were available for reexamination five or more years after the operation. Among these patients there were 201 mold arthroplasties to be reviewed, 81 (the largest group) for degenerative arthritis and 51 for congential dislocation and subluxation. Ability to function and freedom from pain were assessed for each patient. Results were classified as excellent, good, or satisfactory in 164 hips (81.5% of operations among the 171 patients) and unsatisfactory in 37. The analysis showed that all the results classified as excellent were in patients in whom the disease had been unilateral and that bilateral disease was a severe handicap. Supplementary surgery was necessary in 12% of patients. These difficulties must be balanced against the excellent results frequently obtained with complete relief from pain in 27% and unlimited walking in 24% of patients.

SINCE the conception by Smith-Petersen,[1] in 1925, of the principle of mold arthroplasty for treatment of diseases of the hip more than 1,500 mold arthroplasties have been performed at the Massachusetts General Hospital, most of them since the evolution of the Vitallium mold in 1938. Believing that the surgical principles and postoperative management of arthroplasty were well developed by 1945, we took our cases for study from among those patients operated on since Jan. 1, 1946. An examination of the entire group of patients was impractical because of their geographical distribution.

Material

This study is a survey of Vitallium mold arthroplasties performed on Massachusetts residents in the Massachusetts General Hospital during the years from 1946 to 1953. Ward service patients, as well as private patients of one of us (O.E.A.), are included. Patients with rheumatoid arthritis are not included because of the special problems characteristic of this group. Arthroplasties were performed on 246 hips in 213 patients. Of these 171 patients with 201 arthroplasties were examined. The original diagnoses in the series of 201 arthro-

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plastic hips included degenerative arthritis (81), congenital dislocation and subluxation (51), old fractures of the femoral neck (23), septic arthritis and ankylosis (18), septic arthritis (14), traumatic dislocation and/or fractured acetabulum (9), old tuberculous arthritis (4), and chondroma of the acetabulum (1).

Of the 42 patients (14.5%) not included in this study 15 were dead. Eleven of these had been 63 or more years of age at the time of operation. One patient was a complete invalid due to advanced multiple sclerosis. Of the emaining 26 patients 6 were lost to follow-up, 16 were reached but failed to report for examination, and 4 have required

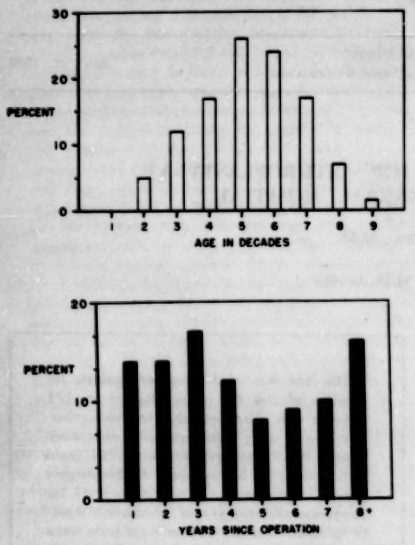

Fig. 1.—Distribution of patients by age at time of operation (*top*) and years since operation at time of study (*bottom*).

supplementary surgery since Jan. 1, 1954. Complications in the original series of 246 arthroplasties included thrombophlebitis, 12 (5%); thrombophlebitis with pulmonary embolism, 9 (3.7%); miscellaneous, 8 (3%); subluxation, 4 (1.6%); wound sepsis, 3 (1.2%); death, 3 (1.2%); and dislocation, 1 (0.4%).

The list of complications was roughly the same as will be found in a survey of any major surgical procedure. There is a remarkable similarity between the complications found in this series and those reported by Hammond and co-workers.[2] The three postoperative deaths reported are the only postoperative deaths in Massachusetts General Hospital experience with mold arthroplasty and have already been reported.[3] One patient, aged 75, died three weeks after operation of a cerebrovascular accident while under anticoagulant therapy for thrombophlebitis. The second death was in a 58-year-old woman who lived for one week after operation and never regained consciousness. A careful postmortem examination revealed no obvious cause of death. The third patient was a 63-year-old man whose condition gradually deteriorated due to postoperative sepsis; he eventually died of bronchial pneumonia four months after operation.

Method of Study.—The patients were interviewed and examined by one of us (E.B.S.). During the interview details of medical history, development of symptoms prior to operation, and course since operation were reviewed following a standard outline. A pain scale and a walking scale similar to those used by the Judets [4] and by Merle d'Aubigne and Postel [5] and a general function scale were devised and applied to each patient. The data thus obtained were placed on punch cards for analysis.

Physical Criteria

The patients were divided for a detailed analysis into three main groups: (1) those with unilateral arthroplasty for unilateral disease, (2) those with bilateral arthroplasty for bilateral disease, and (3) those with unilateral arthroplasty but with bilateral disease. We consider that, regardless of the diagnosis, a patient with unilateral hip disease has fewer problems and a better prognosis than does a patient with bilateral hip disease. The breakdown of clinical and patient evaluations according to diagnosis as well as extent of involvement can be seen in figure 2, which amplifies this statement.[3]

Pain.—It was found that patients had an inaccurate memory of their preoperative pain as judged by review of the hospital and office records. Since there had been no standardized method of recording pain and other symptoms before this study was carried out, it was felt that anything more than a general preoperative evaluation would be highly inaccurate. Therefore, we are reporting only those findings as of the time of examination. We applied the following pain scale: grade 1, no pain; grade 2, mild and inconstant pain allowing normal activity; grade 3, mild pain when walking, disappeared with rest; grade 4, tolerable pain with limited activity; grade 5, severe pain when walking, markedly limited activity; and grade 6, severe pain even at night, interfering with sleep.

The pain chart (fig. 3) shows a good relative freedom from disabling pain. Only 16% were found to have a pain grade of 4 or worse. The pain that patients with mold arthroplasties described was almost always different from that which they had felt before the operation. It was rarely true joint pain and was located in the trochanteric and quad-

riceps regions and described as muscle soreness. It was usually associated with "overdoing," and the patients soon learned how to avoid activities which caused this pain. It was common for a patient who had had the arthroplasty for many years to say that his hip got better with each year.

Walking.—A scale for walking endurance, regardless of the amount of support needed, was used to indicate the development of endurance as follows: grade 1, walks as much as a normal person of the same age and sex; grade 2, walks up to one mile; grade 3, walks up to one-half mile; grade 4, walks only two to three city blocks; grade 5, walks only as necessary (from room to room); and grade 6, unable to walk, leads essentially a bed-and-chair existence.

Figure 3 shows the distribution of walking endurance. Most of these patients were able to walk at least one-half mile in a sustained walk, the poorest being those with unilateral arthroplasty in the presence of bilateral disease. These patients were generally held back by the hip without the arthroplasty. It was found that 18 of the 19 patients with unilateral disease who were at least eight years since operation could walk at least one-half mile, and 18 of the 23 patients with bilateral arthroplasties, at least five years since operation, could walk at least one-half mile. Twenty-four per cent of all patients had unlimited walking endurance.

Support.—The patients were asked to use enough support to keep them from limping and to protect them from muscle fatigue and pain. The use of adequate support allows the patient more comfortable physical activity than is possible without support. As muscle strength and endurance developed we allowed them to diminish the amount of support, but to return to more support if limp or symptoms occurred.[6] After a few months the patients understood this principle and were generally cooperative. Many patients learned to carry a cane long after they had developed a gait with a barely perceptible limp in case they should inadvertently "over-do." Thus, when we say in our charts "cane, part time," we mean that the patient will use the cane out of doors but is not dependent on it. We do not refer to the patient who uses the cane for support out of doors and the furniture indoors. These statements agree with those of Blount[7] and are made to explain the common use of support among our patients. The grading was on a four-point basis, as follows: grade 1, no support; grade 2, can part time; grade 3, cane full time; and grade 4, crutches.

Of the patients with unilateral hip disease about three-quarters used little or no support. This was not true of patients with bilateral disease; only two patients with bilateral arthroplasties walked without some sort of support for one hip or the other, and most of them used a cane to support one hip. Patients with unilateral arthroplasty in the presence of bilateral disease were about as dependent on support in walking as were those with bilateral arthroplasty. Of the entire group 30% used no support, 34% used a cane part time, 21% used a cane full time, and 15% used crutches.

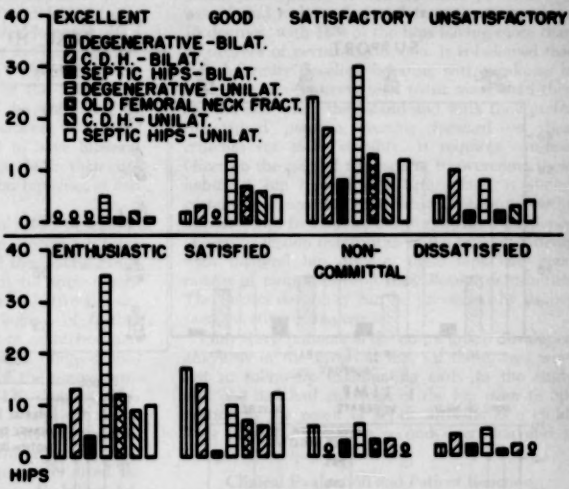

Fig. 2.—Distribution of patients by original diagnosis and two-way evaluation.

General Hip Function.—The following common hip functions were checked on each patient: ability to sit comfortably for one hour, ability to climb stairs foot after foot, ability to tie the shoe on the involved side, ability to squat, and ability to cross the involved leg over the opposite leg.

Only 12 patients out of the entire group were unable to sit comfortably for one hour. This was in contrast to more than two-thirds who had not been able to sit comfortably before operation.

The ability to go up stairs, one foot after the other, is a measure not only of the amount of flexion of the hip but also of its stability. Nearly two-thirds of the patients with mold arthroplasty were able to go up stairs one foot after the other, and about one-half were able to squat.

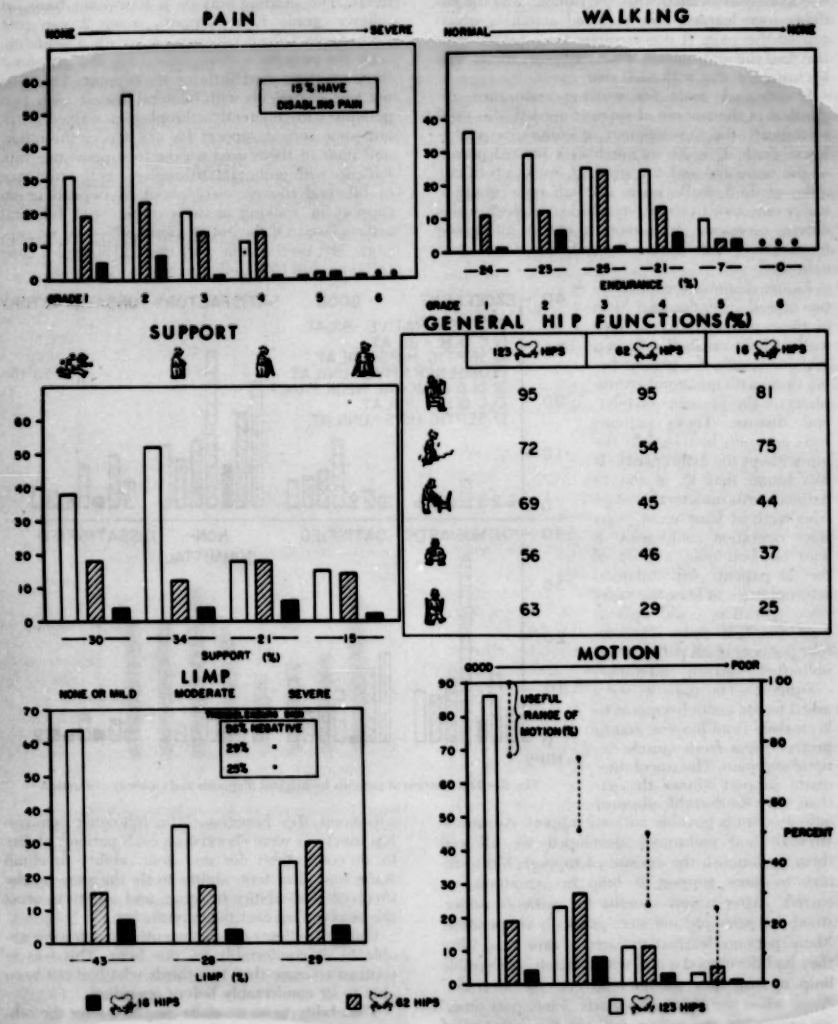

Fig. 3.—Distribution of patients with unilateral repair for unilateral disease (123), bilateral repair for bilateral disease (62), and unilateral repair but bilateral disease (16), by grade of pain, walking endurance, degree of support needed, general hip functions, degree of limp, and useful range of motion. Axis of ordinates: number of hips.

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The ability to tie the shoe and to cross the involved leg over the other leg are measures of flexibility. More than one-half of the patients with unilateral hip disease were able to perform these functions, but those with bilateral disease fell short of one-half in the ability to tie the shoes, and only one-quarter could cross the involved leg over the opposite leg.

Limp.—The patients were observed walking with and without support. The limps were classified without support as none, slight, moderate, and severe. The classification refers only to the hip being studied.

Whereas limping was the rule in those patients with bilateral arthroplasty, about one-half of the patients with unilateral hip disease had little or no limp. The disappearance of the Trendelenburg sign is important to the eventual development of a graceful gait without an abductor lurch. It was frequently found that patients with a Trendelenburg-type gait had a negative result of the Trendelenburg test, and the limp could be corrected by simple gait training. Of the 32 patients with bilateral arthroplasties 4 were found to have bilateral absence of the Trendelenburg sign. More than one-half of the patients with unilateral hip disease had no Trendelenburg sign.

Useful Range of Motion.—The range of motion was measured according to the system of Cave and Roberts,[8] and a factor called the "useful range of motion" was determined. The useful range of motion is defined as the sum of motion between 0 degrees of fixed flexion and 90 degrees of further flexion, and between 20 degrees of adduction and 20 degrees of abduction. The useful range of motion is expressed in percentage of the normal useful range of motion, which is 130 degrees. This motion is measured passively and is kept within the above limits to penalize for fixed deformities. Rotation is not included in this arbitrary evaluation because rotation deformities, except for fixed internal rotation, rarely cause serious disability. Adduction deformities are considered to be very serious. The presence of an adduction deformity automatically puts the hip in the unsatisfactory classification. We have elected to use this method, believing that it yields useful information and is much simpler to use than that suggested by Ferguson and Howorth.[9]

We believe that the maintenance of a good passive range of motion is important, because we expect that, with the increased use of the hip under proper management, the muscles have a good chance to develop functional strength through this range. Figure 3 demonstrates that the arthroplastic hips in patients with unilateral disease had much freer motion than those in patients with bilateral disease. Only 10% of patients with unilateral hip disease had less than 50% useful range of motion. Most of those with poor motion in this group had followed an unsatisfactory postoperative program after discharge from the hospital.

Flexion deformity is not a major problem in patients with unilateral hip disease. Every step they take with the uninvolved hip tends to extend the involved hip. The patients were taught to stand with the hip in extension. It is much easier for patients with only one arthroplasty to care for the hip properly than it is for patients with two arthroplasties. Of the patients with a unilateral arthroplasty for unilateral disease only 17% had flexion deformity in excess of 15 degrees.

The problem is entirely different in the patients with bilateral hip disease, whether they have bilateral arthroplasty or not. Of these patients 60% were found to have flexion deformities in excess of 15 degrees, with 18% of the hips having more than 35 degrees of permanent flexion. It is believed that this deformity develops because, with weakness in both hips, the patients tend to sit more than they should, and when they stand and walk they prefer the tripod position, leaning forward on their crutches for more stability. It requires constant effort on the part of the patient to overcome these habits. A hip treated with arthroplasty is almost certain to assume the fixed flexion deformity of the opposite hip. In general, despite the high incidence of serious flexion deformities in the hips of patients with bilateral hip disease, these hips had good ranges of motion beyond their flexion deformities. The flexion deformity can be prevented by proper postoperative management.[10]

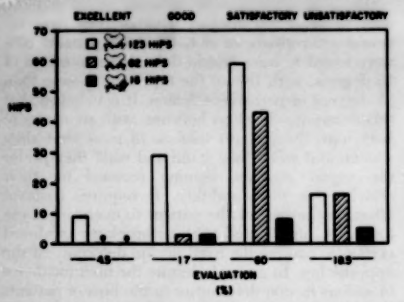
Only three patients in the entire group developed ankylosis in the involved hip. Of these, two were lost to follow-up examination early in the study and one had had ankylosis of the hip prior to operation as the result of septic arthritis as a child. This patient has had a second operation and is doing very well.

Clinical Evaluation and Patient Reaction

The clinical classification of renovated hips was as follows: Excellent: pain, grade 1 or 2 (little or no pain); walking, grade 1 (walks as far as a normal person of the same age and sex); support, none; limp, none or mild; hip functions, can sit comfortably for at least one hour, climb stairs foot after foot, and tie own shoe; useful range of motion, 75 to 100% without adduction deformity (98-130 degrees). Good: pain, grade 1 or 2 (little or no pain); walking, grade 1 or 2 (can walk at least one mile); support, no more than a cane part time; limp, moderate or better; hip functions, can sit comfortably for at least one hour, climb stairs foot after foot, and tie his own shoe; useful range of motion, 50 to 100% without adduction deformity (65-130 degrees). Satisfactory: pain, grade 4 if improved, or grade 3 or better (tolerable with limited activity if

improved or no more than mild when walking, disappearing with rest); walking, grade 4 if improved, or grade 3 or better (two to three city blocks if improved or at least one-half mile); support, may use cane or crutches; hip function, can sit comfortably at least one hour; useful range of motion, 25 to 100% without adduction deformity (33-130 degrees). Unsatisfactory: anything less than satisfactory.

It is obvious that any of the many factors used in this classification may change a given hip one or more categories. It is not enough for an arthroplasty to give good relief of pain; if this were the



EVALUATION	CO-OPERATIVE (%)	UNCO-OPERATIVE (%)
EXCELLENT	5.5	2
GOOD	22.5	5
SATISFACTORY	56	68.5
UNSATISFACTORY	16	24.5
TOTAL —	144	57 HIPS

Fig. 4.—*Top*, distribution of patients by clinical results. *Bottom*, effect of patients' cooperation on clinical evaluations.

case results in more than 80% of the hips in this study would be called excellent. The goal is to establish as near normal function as is possible in each case. In our evaluation of these hips we used normal hip function as the standard as suggested by Hammond and co-workers.[8] This is a very strict measuring stick, but we feel it gives a more readily comprehensible assay of a large group of patients than can be obtained in the use of Judet's amelioration rate [9] or Shepherd's system.[11] In the final analysis, we are interested in how these patients function as compared to the general population. Figure 4 (*top*) shows the comparative results of the three major groups of patients. Of the entire group 4.5% were excellent, 17% were good, 60% were satisfactory, and 18.5% unsatisfactory.

All of the "excellent" hips were found in those patients with unilateral arthroplasty for unilateral disease, comprising 7.5% of that group. A great majority of the "good" hips were also found in these patients. Most patients were eliminated from the "excellent" and "good" classifications by limitations of walking endurance and by inability to tie their shoes and climb stairs foot after foot. Obviously, the functional problems are compounded by the presence of disease in both hips, and only a few patients with bilateral arthroplasty could be expected to accomplish anything beyond "satisfactory" function. Most of the patients with hips classified as "satisfactory" far exceeded the minimum requirements for this classification in most components of the analysis. Of these 61% required no more support than a cane part time.

Of the 201 hips examined, 103 were in ward patients and 98 were in private patients. It was obvious from the beginning of the project that the private patients were much better controlled than the ward patients, although the follow-up examinations in both groups were directed by the same surgeons and the outline of management was the same. As a group, the private patients seemed to grasp the significance of the follow-up program better than the ward patients. There was a much lower rate of failure to meet follow-up appointments among the private patients. In general, the private patients had less pain, could walk farther, required less support, and had less limp, better stability and mobility, and a lower percentage of unsatisfactory hips. Of the ward patients 22% of the hips were unsatisfactory as compared with 14% of the hips of private patients.

Patient Reaction.—During the interview the patient's reaction to the arthroplasty was carefully reviewed and his reaction classified by the examiner as enthusiastic, satisfied, noncommittal, or dissatisfied. Patient reaction data are summarized in figure 5.

The patient reaction was more favorable than the clinical evaluation (fig. 5, *bottom*). A large percentage of patients with unsatisfactory clinical results were quite pleased with the result, usually because of relief of pain. With a few exceptions, the more pain and disability the patient had before operation the more satisfied he was with the result.

Special Groups

Clinically Satisfactory Results.—There were 120 hips which were classified as satisfactory, excluding the excellent and good hips. Of these 120 hips 90 caused little or no pain, 23 caused pain which was mild when walking and disappeared with rest, and 7 caused pain which was tolerable with limited

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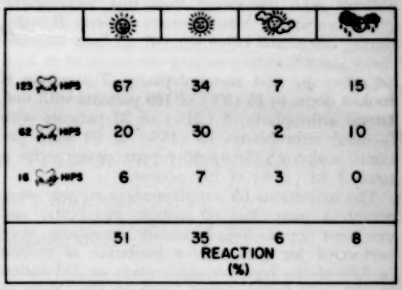
activity. Twenty-two allowed unlimited walking, 26 allowed walking at least one mile, 41 allowed walking at least one-half mile, 24 allowed walking only two or three city blocks, and in seven patients walking was limited to from one room to another. The last seven hips are included in the satisfactory group because conditions other than the hips were the limiting factors. Twenty-seven of the hips required no support, 48 required a cane part time, 30 a cane full time, and 17 required the use of crutches. Forty-seven of the hips did not exhibit Trendelenburg's sign.

Clinically Unsatisfactory Results.—There were 37 hips classified as unsatisfactory. Of these hips 10 caused little or no pain, 6 caused mild pain when walking which disappeared with rest, 15 caused pain which was tolerable with limited activity, 5 caused pain which was severe with walking and limited activity markedly, and 1 caused severe pain at all times, interfering with sleep. Three of these hips allowed unlimited walking, 3 allowed walking to at least one mile, 7 allowed walking up to one-half mile, 15 allowed walking only two or three city blocks, and 9 allowed walking only from one room to another. Four of these hips required no support, 7 required a cane part time, 12 a cane full time, and 14 required crutches. Of the patients with unsatisfactory results 23 were satisfied or enthusiastic and 14 were either noncommittal or dissatisfied.

Shaft Arthroplasty.—The shaft arthroplasty is performed when there is not sufficient head or neck available for the usual positioning of the mold. In this procedure the proximal end of the femoral shaft is prepared by removing the greater and lesser trochanters and placing the mold on the end of the shaft which is then placed in the new acetabulum. The greater trochanter, with the insertions of the hip abductors, is then transplanted down the lateral aspect of the femoral shaft and the iliopsoas tendon to the anterior aspect of the femoral shaft to reestablish the functional length of these muscles. This procedure results in shortening of the femur. Although the shaft arthroplasty yields a weak hip, its function is remarkably good.[10a] Until good femoral head and neck prostheses were developed, this was almost standard treatment at the Massachusetts General Hospital for nonunion and aseptic necrosis after femoral neck fractures. The prosthesis has now taken its place as the preferred treatment in these conditions. Occasionally a hip reconstruction with the use of a prosthesis becomes complicated by sepsis or by disintegration of the proximal end of the femur, but catastrophe can be converted into a satisfactory result by the use of a shaft arthroplasty with a mold.

Of the 21 patients with unilateral hip disease treated with shaft arthroplasty 17 had little or no pain, six were unlimited in their walking, 5 could walk at least one mile, 3 could walk at least one-half mile, 5 could walk only two to three city blocks, and 2 were able to walk only from one room to another. The two patients who could walk only from one room to another were elderly persons who otherwise probably would have been bedridden. Of these patients 10 required no support in walking, 5 used a cane part time, 5 used a cane full time, and 1 was entirely dependent on crutches. Twelve of the patients had no Trendelenburg sign. Although none of the hips could be classified as excellent, 10 were classified as good, 10 as satisfactory, and only 1 as unsatisfactory.

Hips Ankylosed by Septic Arthritis.—There were eight patients in the group examined who had an



CLINICAL EVALUATION	NO. OF HIPS	PATIENT REACTION			
		ENTHUSIASTIC	SATISFIED	NON-COMMITTAL	DISSATISFIED
EXCELLENT	9	ALL	—	—	—
GOOD	35	66	31	—	3
SATISFACTORY	120	46	37	12	5
UNSATISFACTORY	37	16	47	16	21

Fig. 5.—*Top*, distribution of patients by reaction to clinical results. *Bottom*, relation of reaction to clinical evaluation.

arthroplasty performed for septic arthritis of one hip, resulting in ankylosis in poor position. Of these patients four had little or no pain, three had pain which was mild when walking and disappeared with rest, and one had pain which was tolerable with limited activity. One of the patients was unlimited in walking, three were able to walk at least one mile, two were able to walk at least one-half mile, and one was able to walk only two or three city blocks. One patient required no support in walking, three required a cane part time, three required a cane full time, and one required crutches. Four of the eight patients had no Tren-

delenburg sign. One of these hips was classified as excellent, six as satisfactory, and one as unsatisfactory. All of the patients were either satisfied or enthusiastic about the results of surgery.

Three of the four patients who exhibited no Trendelenburg sign were in their teens and one was 5 years old at the time of the original ankylosis. The average time between ankylosis and arthroplasty was 24.5 years for the group as a whole and 15.75 years for those with no Trendelenburg sign. All of the patients with a Trendelenburg sign developed ankylosis before the age of 10 years.

Supplementary Surgery.—Of the 237 hips in 194 patients who underwent their first arthroplastic procedure at the Massachusetts General Hospital during the period being studied, 23 have required major supplementary surgery consisting of at least capsulectomy and acetabuloplasty. This group is broken down to 15 (9%) of 169 patients with unilateral arthroplasty; 8 (24%) of 33 patients with bilateral arthroplasty; 15 (15%) of 99 ward patients; and 8 (8.5%) of 95 private patients; for a total of 23 (12%) of 194 patients.

The indications for supplementary surgery were persistent pain, loss of motion, instability, and persistent sepsis. Supplementary operations were performed for pain and/or limitation of motion in 73% of the hips, for subluxation or dislocation in 13%, and for persistent sepsis in 12%. None of the revised hips was rated as excellent, 19% were rated as good, 58% were rated as satisfactory, and 23% were rated as unsatisfactory. This represents a salvage rate of 77%.

Comment

The study of a group of surgical patients by a surgeon who had no hand in the surgery will usually remain unbiased. A cold clinical study cannot tell the whole story. Many other factors enter into the total picture; such things as enthusiasm or indifference, other demands on the patient's time, and his individual characteristics and physical ability all contribute to the end-result. These same things apply to the doctor and his relationship with his patient. This logically sets up a two-way evaluation of the result: the patient's and the surgeon's evaluation. The over-all results of these two systems were the same, although the finer points of the clinical evaluation were more severe. The patients were more generally pleased than the surgeon. This is as it should be. It will keep us working for better results and at the same time build up our confidence by patients' approval.

The factual data in this study have a major weakness in that they cannot reveal the reasons why we have altered a surgical technique and/or the aftercare of these patients. Yet both of these factors, we believe, have made major differences in the total end-result.[19]

Physiological healing of bone, tendon, and muscle must take place before heavy functional use should be expected or tried. This process will take many months in atrophied bone and weak muscle. It is a gradual process, and any attempt to force or hurry the progress of improvement will often be disastrous.

A gradual, gentle program which includes regular exercise and regular rest is essential. Supportive weight-bearing with both crutches is mandatory until there is clinical and roentgenologic evidence of bone healing. The gradual loss of sensitivity in and about the hip with roentgenologic evidence of increasing homogeneous density is a guide to increasing activity. The management of the reconstructed hip joint follows closely that of a fracture of the femur with a little more concern about weight-bearing and a little more time for dense healing. This is necessary because the weight falls on a small surface and the levered forces act on these surfaces.

Summary and Conclusions

The following conclusions can be drawn from our study: 1. The surgical hazards of mold arthroplasty are not great. 2. Relief of disabling pain may be expected in 85% of patients, with complete relief of pain in 27%. 3. Unlimited walking may be expected in 24%, walking without support in 30%, with a cane part or full time in 55%, and with crutches in 15%. 4. A wide useful range of motion may be expected in patients with unilateral disease, and a limited useful range of motion may be expected in those with bilateral disease. 5. A satisfactory or better result may be expected in 81.5% of patients, good to excellent result in 28% of those who are able to follow the postoperative program, and good to excellent results in 7% who are unable to follow the postoperative program. The group of patients unable to follow the postoperative program may expect a one-third greater chance of obtaining an unsatisfactory result. 6. There is no constant correlation between the clinical evaluation of the result of surgery and the patients' own evaluation. 7. Supplementary surgery may be required in 12% of patients, with an expected salvage rate of 77%.

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STUDY OF SURGICALLY EXCISED PULMONARY GRANULOMAS

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The cause of the majority of surgically excised pulmonary granulomas has not been determined, even with extensive bacteriological studies. However, through application of Gomori's methenamine-silver nitrate stain (GMS) to 138 such surgically excised lesions over a two-and-a-half-year period, it was possible to identify "structures" resembling Histoplasma capsulatum or Coccidioides immitis in 55.9%. Despite extensive efforts, it was not possible to obtain fungus growths from these structures, which are thought to be nonviable fungi that have lost their ordinary stainability. With the GMS stain, fungi can be found in tissue sections more rapidly and under lower magnification than by other staining methods.

The cause of the majority of surgically excised pulmonary granulomas has not been determined, even with extensive bacteriological studies. In 1951, Good and associates [1] found it possible to identify a causative agent in only 21 of 65 surgically excised pulmonary granulomas with use of standard bacteriological and histological methods. In general, granulomas are excised from the lung because a diagnosis of pulmonary malignant tumor cannot be excluded; approximately one-third of solitary masses excised from the lungs are granulomas.[2] For the past two and one-half years, Gomori's methenamine–silver nitrate stain [3] (GMS) has been applied at the Mayo Clinic to these surgically excised pulmonary granulomas in addition to the routine bacteriological and histological methods; this study was undertaken in an attempt to evaluate the results obtained with the GMS stain as an aid in determining the cause of these granulomas.

Methods and Materials

Methods.—Since September, 1946, all surgically excised pulmonary granulomas have been examined at the clinic by the following procedure: If the surgeon suspects that the pulmonary mass he is resecting is a granuloma, he bisects the specimen and, utilizing aseptic techniques, places half of the specimen in a sterile container for bacteriological studies and sends the other half to the surgical pathology laboratory for identification by examination of fresh frozen sections (with use of Terry's modified polychrome methylene blue).

If the surgical specimen contains a granuloma, the half in the sterile container is ground aseptically in a mortar and pestle with 60-mesh aluminum oxide (alundum), and a 20% suspension is made in broth. This suspension is then inoculated by the massive-inoculation technique, that is, a few drops of the suspension are placed on the medium and distrib-

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uted with a glass rod; these mediums are used: hormone blood agar [4] at 37 C, 30 C, and, in 10% carbon dioxide solution, 37 C (all in duplicate); chocolate agar in 10% carbon dioxide solution at 37 C; thioglycollate broth or brain broth at 37 C; Lowenstein-Jensen medium at 37 C (in duplicate); Petragnani's medium at 37 C (in duplicate); and subcutaneous and intraperitoneal inoculation into two guinea pigs.

The organisms most frequently encountered as the causative agents of pulmonary granulomas are the pathogenic deep fungi, Mycobacterium tuberculosis, Brucella, Nocardia, Actinomyces, and Hemophilus influenzae. Routine cultures are observed for three weeks, cultures for Myco. tuberculosis for a maximum of eight weeks, and inoculated guinea pigs for eight weeks. Depending on the results of these cultures and animal inoculations, special stains are used and appropriate subcultures made.

Mainly on the basis of gross appearance, pulmonary granulomas can be classified into one of three main morphologic types: (1) tuberculoma-like—discrete, solitary, well-circumscribed, nodular, caseous, nonexcavating, granulomatous lesions; (2) infiltrative—diffuse lesions with multiple foci of caseous and noncaseous, nonexcavating, granulomatous reactions; and (3) excavating—excavating caseous lesions with granulomatous reactions. Of the 138 granulomas stained by the GMS technique, 92 were of the tuberculoma-like type, 29 were of the infiltrative type, and 17 were of the excavating type.

For purposes of discussion, the 138 GMS-stained pulmonary granulomas were placed into three groups based on the bacteriological and histological findings in each granuloma. Group A, positive culture, included those granulomas in which the causative organisms were isolated by culture. Group B, negative culture and positive histopathology, included those granulomas in which "structures" resembling organisms were found by histological methods but all attempts to culture these structures were unsuccessful; also included in this group were lipoid granulomas and eosinophilic granulomas. Group C, negative culture and negative histopathology, included those granulomas which were culturally sterile and in which no structures resembling organisms were observed histologically.

TABLE 1.—*Etiological Factors in 138 Surgically Excised Pulmonary Granulomas as Shown by Culture or Special Stains or Both*

Group	Type of Granuloma									
	Tuberculoma-like		Infiltrative		Excavating		Total	
	No.	%	No.	%	No.	%	No.	%
A—Positive culture	5	5.5	15	51.9	13	76.5	33	23.9
Mycobacterium tuberculosis	2	2.2	6	20.9	11	64.7	19	13.8
Coccidioides immitis	2	2.2	3	10.4	..	..	5	3.6
Cryptococcus neoformans	..	..	3	10.4	..	..	3	2.2
Saprophytic acid-fast bacilli	..	..	..	..	2	11.8	2	1.4
Brucella suis	1	1.1	..	..	..	..	1	0.7
Histoplasma capsulatum	..	..	1	3.4	..	..	1	0.7
Blastomyces dermatitidis	..	..	1	3.4	..	..	1	0.7
Aspergillus	..	..	1	3.4	..	..	1	0.7
B—Negative culture and positive histopathology	75	81.5	4	13.8	0	0.0	79	57.3
Structures resembling H. capsulatum	67	72.8	1	3.4	..	..	68	49.4
Structures resembling C. immitis	7	7.6	..	..	..	..	7	5.1
Acid-fast bacilli	1	1.1	1	3.4	..	..	2	1.4
Lipid granuloma	..	..	1	3.4	..	..	1	0.7
Eosinophilic granuloma	..	..	1	3.4	..	..	1	0.7
C—Negative culture and negative histopathology	12	13.0	10	34.5	4	23.5	26	18.9
Total	92	100.0	29	100.0	17	100.0	138	100.0

The other half of the granuloma, which had been utilized for the frozen section, is embedded in paraffin, sectioned, and stained as follows: routine stain, hematoxylin and eosin; acid-fast bacilli, night-blue stain [5] counterstained with safranine; and fungi, periodic acid–Schiff stain (PAS) used from 1952 to 1955 and GMS [6] from 1956 to the present. These slides are available by noon of the following day; if "structures" resembling organisms are seen histologically, the bacteriology laboratory is notified so that appropriate extra mediums may be inoculated if necessary.

Materials.—From September, 1946, through June, 1958, a total of 603 surgically resected pulmonary granulomas have been studied by means of the routine procedure outlined above. None of the 465 granulomas excised before 1956 were stained by the GMS technique. There were 138 granulomas excised during the two-and-one-half-year period from January, 1956, through June, 1958; all these granulomas were stained by the GMS technique.

Observations

The results of study of the 138 GMS-stained pulmonary granulomas are summarized in table 1. Results of culture in approximately one-fourth (23.8%) of the granulomas were positive (group A). More than half (55.9%) of the granulomas were found to contain structures that resembled organisms on microscopic examination of the GMS-stained sections; all attempts to culture these structures were unsuccessful (group B). Approximately one-fifth

(18.9%) of the granulomas were culturally sterile and contained no structures resembling organisms on histological examination (group C).

Of the 92 tuberculoma-like pulmonary granulomas, only 5 gave positive results on culture (group A), while 80.4% of the granulomas contained microscopic structures resembling organisms that could not be grown on culture mediums (group B). These structures, observed in the GMS-stained sections, resembled Histoplasma capsulatum (fig. 1*a* and *b*) in 72.8% and Coccidioides immitis (fig. 2) in

Fig. 1.—Structures histologically resembling H. capsulatum in culturally sterile pulmonary granuloma. *a*, GMS, ×400; *b*, GMS, ×970; *c*, PAS, ×970.

7.6% of these tuberculoma-like granulomas. These structures resembling organisms were found scattered in the central caseous debris of the pulmonary granulomas. With the PAS stain (fig. 1*c*), these structures appeared to be distorted forms of H. capsulatum; many of them had lost their central, purplish-red mass. In one granuloma in group B, acid-fast bacilli were observed in the section stained by the night-blue technique but all cultures of this lesion gave negative results. Also included in this group were one lipoid granuloma and one eosinophilic granuloma. Only 13% of the tuberculoma-like pulmonary granulomas gave negative cultural and histological results (group C).

Of the 29 infiltrative pulmonary granulomas, more than half (51.9%) gave culturally positive results (group A). Only one pulmonary granuloma of the infiltrative type contained structures histologically resembling H. capsulatum in the GMS-stained section and gave negative results on culture (group B). Sputum culture from the patient from whom this pulmonary granuloma was excised had given positive results for H. capsulatum approximately nine months prior to excision of the pulmonary lesion. After one month of rest in bed, his sputum no longer had shown evidence of H. capsulatum. Five months before operation, he had been treated for 10 weeks with amphotericin B. The lesion removed at operation was diffuse and was classified as an infiltrative pulmonary granuloma.

Of the 17 excavating pulmonary granulomas, more than three-fourths (76.5%) gave culturally positive results (group A). Fungi were not seen in any of the GMS-stained sections of these granulomas.

Fig. 2.—Structures histologically resembling C. immitis in a culturally sterile pulmonary granuloma. Endosporulating spherule on left, developing spores on right (GMS, ×970).

Only 1 of the 69 granulomas that contained structures resembling H. capsulatum on GMS-stained sections gave positive results on culture. This lesion is illustrated in figure 3. The structures in this lesion were present in intact macrophages instead of being scattered in the caseous debris. C. immitis was isolated by bacteriological methods from 5 of the 12 lesions that contained structures resembling this fungus.

Data comparing the pulmonary granulomas excised before use of the GMS technique with those excised subsequently are summarized in table 2. The percentage of granulomas in the positive culture group (group A) decreased from 36.8 to 23.8. The percentage of granulomas with negative culture and positive histopathology (group B) increased approximately 10 times (5.8 to 57.3%). In only one

culturally sterile granuloma in the group in which the GMS stain was not applied were structures found that histologically resembled H. capsulatum, and in only one culturally sterile granuloma in this same group were structures found that histologically resembled C. immitis; the structures in both of these granulomas were found in sections stained by the PAS technique. The percentage of granulomas with negative culture and negative histopathology (group C) decreased approximately threefold (57.4 to 18.9%).

Fig. 3.—Structures histologically resembling H. capsulatum in a pulmonary granuloma culturally positive for H. capsulatum. *a*, GMS, ×480; *b*, GMS, ×970; *c*, PAS, ×970.

Clinical Data and Pathology

Clinical Data.—As already noted, 68 of this series of 138 patients had pulmonary granulomas that were culturally sterile but in which GMS-stained sections showed structures morphologically resembling H. capsulatum. Table 3 lists the resident states and countries of these 68 patients and compares the percentage of them residing in these states and countries with the percentage of all Mayo Clinic patients residing in these same states or countries. Figure 4 indicates the geographical distribution of cutaneous sensitivity to histoplasmin (percentage of positive reactors) in the United States, based on the analysis of Furcolow,[9] as well as the percentage of the 68 patients residing in each state.

Approximately 45% of these patients came to the clinic specifically for evaluation of a solitary nodule or "coin" lesion that had been found on a thoracic roentgenogram taken either as part of a routine

Table 2.—*Diagnostic Grouping of 603 Surgically Excised Pulmonary Granulomas*

Group	GMS Stain: Not Applied (9/1/48 to 12/31/55) No.	%	GMS Stain: Applied (1/1/56 to 6/30/58) No.	%
A—Positive culture	171	36.9	33	22.8
B—Negative culture and positive histopathology	27	5.8	79	57.3
C—Negative culture and negative histopathology	267	57.4	26	18.9
Total	465	100.0	139	100.0

physical examination or during a survey by a mobile unit; in the remaining 55% of the patients, the pulmonary lesion was first discovered in the thoracic roentgenogram taken as part of the routine examination at the clinic. These patients had no pulmonary symptoms or physical signs that could be related to an infectious process at the time of their examinations. Approximately 90% of the patients could not recall any definite episodes in their histories when they might have been infected with H. capsulatum; about 10% of the patients did recall an episode of malaise and fever lasting from 1 to 10 days that was sometimes accompanied by cough or thoracic pain. In general, these episodes had been diagnosed as an infection of the upper part of the respiratory tract, influenza, or atypical pneumonia. The thoracic roentgenograms were described as showing a solitary, nodular, sharply circumscribed

Table 3.—*Residence of Sixty-eight Patients with Culturally Sterile Pulmonary Granulomas Containing "Structures" Resembling Histoplasma capsulatum as Compared to That of All Mayo Clinic Patients*

Residence	Patients with Granulomas No.	%	All Mayo Clinic Patients, %
Illinois	21	30.8	9.7
Iowa	12	17.6	10.0
Wisconsin	11	16.2	6.5
Minnesota	10	14.7	37.9
Indiana	3	4.4	3.9
Missouri	2	2.9	2.0
Nebraska	2	2.9	2.5
Michigan	1	1.5	2.5
Kentucky	1	1.5	0.4
Arkansas	1	1.5	1.1
Oklahoma	1	1.5	1.3
Texas	1	1.5	1.3
Montana	1	1.5	1.6
Canada	1	1.5	4.0
Other states and countries	0	0	15.3
Total	68	100.0	100.0

lesion varying from 1 to 3 cm. in diameter. Calcium was recognized in these routine roentgenograms in only 2 of the 68 cases. Tomography was performed in 54 of the 68 cases; calcification was found in five lesions, and questionable calcification was found in four additional lesions. The results of intracutaneous

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tests with histoplasmin, tuberculin, coccidioidin, and blastomycin are summarized in tables 4 and 5. In only 24 of the 68 cases had the histoplasmin skin test been applied; the results were positive in 22 of the cases and negative in 2.

hospitalized in a sanatorium with chills, fever, and thoracic pain but was released when tuberculosis had been excluded. The lesions observed in the thoracic roentgenograms in these seven patients were similar to those seen in the 68 patients dis-

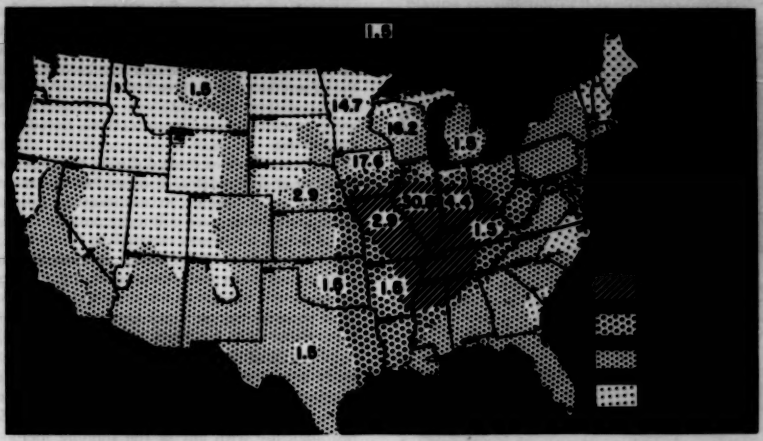

Fig. 4.—Geographic distribution of cutaneous sensitivity to histoplasmin in United States (data from Furcolow[4]). Numbers indicate percentages from each state of our 68 patients with culturally sterile pulmonary granulomas containing structures resembling H. capsulatum.

Seven of the 138 patients had pulmonary granulomas that gave negative results on culture but in which the GMS-stained sections showed organisms morphologically resembling C. immitis. Six of these patients had resided or traveled in California, and the seventh patient's residence was in Arizona. The chief complaint of three of these patients was a solitary pulmonary nodule that had been found on a thoracic roentgenogram taken in their home town; in the other four patients, the lesion was first discovered in the thoracic roentgenogram taken as

cussed in the preceding paragraph. Calcification was not observed in the routine roentgenograms, and tomography, performed in four of the seven cases, also failed to reveal any calcification. In two of the patients, three intracutaneous tests (coccidioidin, histoplasmin, and tuberculin) had been utilized and all three gave positive results. In an additional two patients, only the tuberculin skin test had been used; it gave positive results in one patient and negative results in the other. Intracutaneous tests were not given to the remaining three patients.

TABLE 4.—*Results of Skin Tests in Sixty-eight Patients with Culturally Sterile Pulmonary Granulomas Containing Structures Resembling Histoplasma Capsulatum*

Results	Skin Tests			
	Histoplasmin	Tuberculin	Coccidioidin	Blastomycin
Positive, no.	22	29	0	0
Negative, no.	2	17	10	2
Not performed, no.	—	—	—	—
Total	24	37	10	2

TABLE 5.—*Histoplasmin and Tuberculin Skin Reactions in Sixty-eight Patients with Culturally Sterile Pulmonary Granulomas Containing Structures Resembling Histoplasma Capsulatum*

Tuberculin	Histoplasmin		
	Positive	Negative	Not Performed
Positive, no.	10	2	0
Negative, no.	10	0	7
Not performed, no.	2	0	29

part of the routine examination at the clinic. These patients did not have any pulmonary symptoms or physical signs that could be related to an infectious process at the time of their examinations. Five of the patients had been asymptomatic. In 1952, one patient had been treated with streptomycin for "desert fever." In 1955, another patient had been

Pathology.—The culturally sterile pulmonary lesions observed in the 68 granulomas containing structures histologically resembling H. capsulatum and in the seven granulomas containing structures histologically resembling C. immitis were identical on gross and microscopic examination except for the presence of the different structures observed in the

GMS-stained sections. In addition, these lesions could not be differentiated from the "tuberculomas" observed in infections with Myco. tuberculosis other than by identifying the offending organisms (fig. 5). The lesions were solitary, circumscribed, and grayish-white, and they varied from 1 to 3 cm.

Fig. 5.—Typical gross appearance of surgically resected pulmonary granulomas. *Left*, culturally sterile lesion containing structures histologically resembling H. capsulatum. *Right*, lesion containing acid-fast bacilli and culturally positive for Myco. tuberculosis.

in diameter, with a central caseous zone (sometimes containing flecks of calcium) and peripheral concentric laminations. The consistency varied from semifluctuant to hard and rubbery. These 75 lesions were all grossly and microscopically identical and were characteristic of tuberculoma-like granulomas, with the exception of the one lesion that was of the infiltrative type.

Additional Studies

In a further attempt to evaluate the effectiveness of the GMS stain for demonstrating fungi in tissue, sections of selected granulomas excised prior to January, 1956, were stained by the GMS technique. Application of this stain to the 65 granulomas studied by Good and associates [1] revealed the presence of structures resembling H. capsulatum in 20 of the 44 previously indeterminate lesions and structures resembling C. immitis in two of the previously indeterminate lesions. Thus, with the GMS stain, structures resembling organisms were found in 50% of the previously indeterminate, culturally sterile pulmonary granulomas.

In 1954, Starr and co-workers [7] carried out two series of studies in an attempt to evaluate the effectiveness of the PAS stain for demonstrating fungi in tissue. The first series consisted of 50 culturally sterile pulmonary granulomas excised from 1946 through 1953; 22 of these lesions were tuberculoma-like, 21 were infiltrating in type, and seven were of the excavating type. No organisms were found by routine staining with hematoxylin and eosin. The PAS stain revealed the presence of structures histologically resembling H. capsulatum in only 1 of these 50 granulomas, and this lesion was tuberculoma-like. In many of the PAS-stained sections of the granulomas, Starr and associates [7] observed fine red rings surrounding a clear zone without any central purplish-red mass but they would not make a diagnosis of structures resembling H. capsulatum unless such a mass was present. As part of the present study, application of the GMS stain revealed the presence of structures resembling organisms in 16 of these 50 granulomas; these structures were found only in the tuberculoma-like granulomas. In 15 of the granulomas, structures histologically resembling H. capsulatum were observed; structures histologically resembling C. immitis were noted in one granuloma.

The second series studied during the same period by Starr and associates [7] consisted of 61 lesions (including other lesions in addition to pulmonary granulomas) that were culturally positive for pathogenic fungi. Structures resembling fungi had been observed previously in sections stained with hematoxylin and eosin and occasionally by the Brown-Breen-Gram, Stoughton, or Best-Bodian method in 30 of these 61 lesions. The PAS stain disclosed structures believed to be fungi in 21 additional lesions. Application of the GMS stain as part of the present study revealed structures morphologically consistent with fungi in six more lesions. Therefore, structures resembling organisms have not been found histologically with any of the staining methods in only four of these 61 culturally positive lesions (table 6).

Comment

For demonstration of acid-fast bacilli in sections of tissue, we prefer the night-blue stain with safranine counterstain to the more commonly used Ziehl-Neelsen stain, since we found that blue-stained acid-fast bacilli are much easier to see than red-stained acid-fast bacilli. Hallberg [8] discussed the many advantages of the night-blue stain in comparison to other acid-fast staining methods.

Table 6.—*Demonstration of Fungi in Stained Sections of Tissues from Patients with Positive Cultures for Fungi, Mayo Clinic, 1946-1953*

Structures Resembling	No. of Sections	Positive on Histological Examination, No.				
		Routine Examination	PAS Stain	GMS Stain	Total	Unidentified, No.
Histoplasma capsulatum	18	11	5	2	18	0
Coccidioides immitis	20	6	9	3	18	2
Blastomyces dermatitidis or brasiliensis	15	9	5	1	15	0
Cryptococcus neoformans	3	2	1	0	3	0
Sporotrichum schenckii	5	2	1	0	3	2
Total	61	30	21	6	57	4

Grocott [9a] first suggested using Gomori's methenamine-silver nitrate stain for the demonstration of fungi in tissue. Zimmerman [9] mentioned the various advantages of this technique as compared to meth-

ods with other stains for fungi. Since the GMS method affords such a sharp contrast between the fungi, which are stained intensely black, and the background, which is almost colorless, it is possible to find fungi more rapidly and under lower magnification than with other staining methods. Structures believed to be fungi frequently can be demonstrated with the GMS technique when they cannot be found with other staining methods (fig. 6). It is pertinent to emphasize that these organisms are found in the central caseous debris of the granuloma; consequently, it is important that sections be taken to include this central caseous zone. These culturally sterile structures that are only demonstrated by special histological methods are thought to be nonviable fungi that have lost their stainability by ordinary methods."

In the tuberculoma-like type of pulmonary granulomas, which at one time were thought to be pathognomonic of infection with the tubercle bacillus, Myco. tuberculosis was cultured in only 2.2% of lesions; in an additional 1.1% of these granulomas, acid-fast bacilli were observed microscopically but could not be cultured. However, structures resembling H. capsulatum were observed in 72.8% of these tuberculoma-like pulmonary granulomas; in an additional 7.6% of these lesions, structures resembling C. immitis were noted. The tuberculoma-like lesion is assumed to be the healing or healed phase of a pulmonary infection.

Current literature indicates some trend toward the view that improved staining methods can replace microbiological techniques. However, special stains are capable of demonstrating only a few of the specific pathogens, whereas the problem in a granulomatous lesion is to demonstrate one of a wide variety of causative agents. Multiple organisms occasionally are isolated from a single granuloma. Obviously, large numbers of infections by the tubercle bacilli or brucellar organisms would go undiagnosed if resort to cultural methods were abandoned. Furthermore, even when a fungus can be demonstrated histologically it is often difficult, if not impossible, to identify the genus with certainty by histological examination alone. With the existence of small forms of Blastomyces and large forms of Histoplasma, one might question the validity of any purely morphologic identification of either of these organisms in tissue. On occasion, Blastomyces, Cryptococcus, and Coccidioides have been confused with one another by the surgical pathologist when he observes these organisms in tissues removed at operation. Another pitfall inherent in morphologic methods is the presence of artifacts that may closely simulate certain pathogenic fungi. Finally, in many granulomas, cultures have revealed the presence of a causative organism that had not been observed in sections of tissue stained by multiple special techniques.

Summary and Conclusions

More than half (55.9%) of a series of 138 surgically excised pulmonary granulomas studied at the Mayo Clinic during a two-and-one-half-year period contained "structures" histologically resembling Histoplasma capsulatum or Coccidioides immitis when stained by Gomori's methenamine–silver nitrate (GMS) technique. Extensive efforts to obtain growth of fungi from these structures were unsuccessful. These culturally sterile structures are thought to be nonviable fungi that have lost their stainability by ordinary staining methods.

With the GMS stain, fungi can be found in sections of tissue more rapidly and under lower magnification than they can by means of other staining methods. Fungi can be demonstrated frequently with the GMS technique when they cannot be found with other staining methods. Staining methods cannot replace cultural methods; rather, the two methods are supplementary.

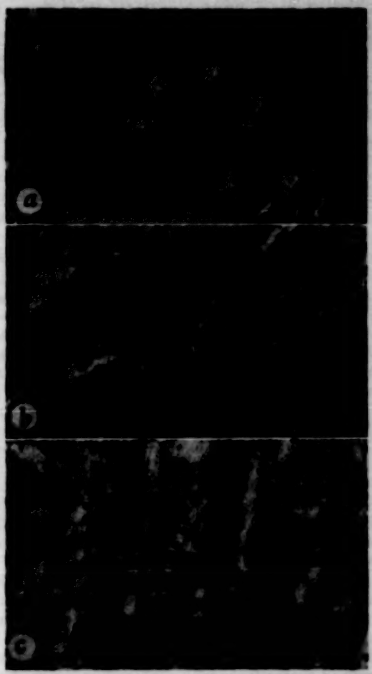

Fig. 6.—Consecutive sections of same area in caseous center of culturally sterile pulmonary granuloma. *a*, hematoxylin and eosin, ×480; *b*, PAS, ×480; *c*, GMS, ×480.

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VASCULAR ACCIDENTS TO THE BRAIN STEM ASSOCIATED WITH NECK MANIPULATION

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A woman, aged 31, had nausea, vomiting, slurred speech, and diplopia after vigorous manipulation of the neck during chiropractic treatment. There was weakness of the left arm and leg and decreased sensation for touch and pallesthesia over the left half of the body, including the face. The patient's underlying disease was believed to be multiple sclerosis, but the acute episode represented a brain-stem vascular accident secondary to manipulation of the neck. A man, aged 55, had a similar treatment twice. Signs and symptoms became worse with each manipulation. Examination revealed Horner's syndrome on the left side, paralysis of the left vocal cord, and diminished sensation of pain and temperature over the right half of the body. Manipulation of the neck can significantly narrow the lumen of the vertebral artery, and susceptibility to such accidents may depend on an abnormal vascular supply to the basilar arterial system.

Vascular accidents involving the brain stem after vigorous manipulation of the neck have been reported in the past.[1] The mechanism underlying such a catastrophic event was first suggested by De Kleyn and Nieuwenhuyse [2] in a study conducted on autopsy material. They found that extension of the neck and turning the chin to one side severely compromised the circulation through the opposite vertebral artery. Tatlow and Bammer [3] confirmed these findings and supplied postmortem angiographic evidence showing narrowing of the vertebral artery at the atlanto-occipital joint during extension and rotation of the head.

We have recently encountered two examples of this disorder. They are unusual in that the first patient had an underlying neurological disease and had the acute vascular signs engrafted on this. In the second patient, the signs and symptoms progressed successively with each manipulation. Also, the second patient reported pallesthesia (sensation experienced at a point remote from that stimulated), which is infrequently seen with brain-stem lesions.[4]

Report of Cases

Case 1.—A woman, aged 31, was admitted to the University Hospital on June 31, 1957. There was a 10-year history of intermittent diplopia and blurring of vision, with a tentative diagnosis of multiple sclerosis. One week prior to admission, she had a chiropractic adjustment for abdominal distention. Immediately after vigorous manipulation of her neck, she became violently dizzy, vomited, and lost power and sensation in the left arm and leg. Nausea and vomiting persisted for two days along with slurred speech and diplopia.

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On her initial examination one week after the onset, there was weakness and clumsiness of the left arm and leg and decreased sensation for touch, pain, and pallesthesia over the left half of the body, including the face. The Romberg sign was present, nystagmus was noted on left and right lateral gaze, and a Babinski toe sign was present on the left. Results of laboratory studies were normal except for a first-zone rise in the spinal fluid colloidal gold curve. Roentgenograms of the cervical vertebrae, including views of the odontoid process, were normal. Over the next few months, there was almost complete recovery of the strength and sensation in the left arm and leg. The subsequent course of the condition made us feel that the patient's underlying disease was multiple sclerosis but that the acute episode represented a brain-stem vascular accident secondary to manipulation of the neck.

Case 2.—A man, aged 55, was admitted to the Veterans Administration hospital on Aug. 2, 1957. He had sought chiropractic treatment two weeks before for a "strained back and stiff neck." He had been placed on his stomach and his head was rotated to the right and left until his neck "popped." One-half hour after the treatment, he staggered when attempting to walk and could not place his right leg properly. The next morning, the right arm was numb. The following day, he had a similar adjustment, and after this his whole right side was insensitive to pain and he could not discriminate temperature changes, but he mainitained the sensation of touch. The right side of the forehead was also numb, the left side of the face did not sweat, and his voice was hoarse.

His admission examination revealed Horner's syndrome on the left, peripheral-type weakness of the left side of the face, deviation of the palate to the right, paralysis of the left vocal cord, weakness of the right arm and leg, diminished pain and temperature (but not touch) over the right half of the body, and slight hypalgesia and hypesthesia of the right side of the forehead. When the right side of his chest was touched, he felt a lightning-like sensation at a similar spot on the left side. Laboratory examinations were normal except for a slightly elevated blood sugar level. Roentgenograms of the cervical vertebrae were interpreted as showing osteoarthritis with lipping of the vertebral bodies. The findings did not change during his hospitalization.

Comment

As it can be readily demonstrated that manipulation of the neck can significantly narrow the lumen of the vertebral artery,[3] it is unusual that only two such cases have been seen in recent years. The chiropractic method was started in Iowa, being introduced near the turn of the century. It is exceptional to interview a patient on the neurological service who has not at some time had one or several neck manipulations. The rarity of vascular accidents, therefore, must stem from one or more of the following conditions being present in the affected cases: 1. The manipulation is unusually violent. 2. The bony structures in apposition to the vertebral arteries must be abnormal by virtue of congenital or degenerative changes. 3. There is underlying vascular disease such as atherosclerosis. 4. There is an abnormal vascular pattern, such as one vertebral artery or one effective vertebral artery which constitutes the major blood flow into the basilar system.

Judging from the vivid descriptions of a typical adjustment, it would seem that there is no paucity of vigorous neck manipulations. Thus, this is probably not a significant factor. Roentgenograms of the cervical vertebrae for the two patients reported on here and for most of the other cases mentioned in the literature have been normal or, at most, showed some osteoarthritis. This does not rule out some subtle change at the atlanto-occipital region, but it is unlikely. The ages (32, 35, 35, 37, 41, 28, 31, and 55) of the patients reported on here and in the literature fell mainly in the fourth decade, so that the presence of advanced atherosclerosis is probably not a determinant. The last possibility, an abnormal vascular pattern, was suggested by De Kleyn and Nieuwenhuyse [4] to account for dizziness and nystagmus in some of their patients when the head was placed in certain positions in relation to the trunk. They found that occasionally one vertebral artery was much larger and reasoned that occlusion of this would embarrass the blood supply of the brain stem. This last explanation seems most likely to account for the reported complication and also for the rarity of brain-stem vascular accidents after manipulations in a population which is overly exposed to such treatment.

Summary

Two patients developed symptoms and signs suggestive of brain-stem vascular accidents after chiropractic manipulation. Other investigators have shown that the vertebral arteries may be compressed during such manipulations. The rarity of this occurrence is ascribed to the fact that the susceptible patient may have an abnormal vascular supply to the basilar arterial system.

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INTRADERMAL IMMUNIZATION AGAINST ASIAN INFLUENZA IN CHILDREN

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The effectiveness of intradermally injected vaccine against Asian influenza was studied in an orphanage in Memphis, Tenn., with 168 children between the ages of 1 and 17 years. A single lot of monovalent Asian strain type A influenza vaccine containing 200 chick cell agglutination units per milliliter was used throughout the study. The outbreak of influenza in the orphanage began on the same day as in the city of Memphis. Four cases occurred before the first injection, 17 between the first and second, and 5 after the second. The outbreak in the orphanage had substantially ceased before the citywide epidemic had reached its peak. Comparison of the hemagglutination-inhibition titers of serum samples obtained before and after the injections, with a consideration of the time relation of the cases among the different age groups in the orphanage, indicated that the vaccine was effective when given intradermally.

Vaccination has proved to be the only effective method of control against influenza. Because of the possibility of sudden antigenic changes in the virus and the greater effectiveness of a homologous vaccine against the current strain, there may not be time, in the face of an epidemic caused by a new variant of the virus, to prepare sufficient vaccine to protect large population groups. Under such circumstances more persons could be immunized by the intradermal route, which requires less vaccine, if this is proved to be as effective as the conventional subcutaneous route. Whether or not the intradermal route is an effective method of immunization for adults has not been definitely established. However, this method has been a recommended procedure for young children [1] and deserves further study for reasons mentioned above.

During the 1957 Asian influenza outbreak in Memphis, Tenn., we were requested to vaccinate the children of an orphanage. This afforded an opportunity to observe the effectiveness of Asian influenza vaccine given intradermally in the face of an epidemic, and this paper summarizes our experiences.

Materials and Methods

Population.—This study was conducted in an orphanage with 168 children between the ages of 1 and 17 years. Infants under 1 year were not included in the study; however, those from 6 months to 1 year of age were immunized. The orphanage separated the children by age groups for convenience of their care. Two groups of preschool-aged children of mixed sexes, those between 1 and 3 years of age and those between 3 and 6 years of age, were located in a separate building. These had separate dining rooms and play rooms, and they slept, on different floors, in rooms containing two to three beds. The youngest group was supervised by a registered nurse. The girls of the oldest age group (10-17 years) helped to bathe and dress the younger children each evening, which resulted in daily mixing between these age groups.

The school-aged children were divided into two groups, aged 6-10 and 10-17 years, who lived in an area separated from the younger age groups. These two groups of older children took meals in a communal dining room. The dormitories were large,

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unpartitioned rooms, one each for boys and girls of the 6-10-year group and one each for boys and girls of the 10-17-year group. The children of the first four grades (6-10 years) attended school on the premises of the orphanage. The older children went to public or parochial schools in the city.

There were two visiting Sundays a month and much interval visiting to the institution. Thus the children, particularly the older children, had considerable contact with people outside of the orphanage.

Vaccination.—The first dose of vaccine was given to the children between Oct. 18 and 22. A single lot (035331-B) of monovalent Asian strain type A influenza vaccine containing 200 chick cell agglutination (CCA) units per cubic centimeter was used throughout the study. One-tenth cubic centimeter was given intradermally on the flexor surface of the forearm, and this dose was repeated in seven or eight days.

Laboratory Methods.—Virus isolations were attempted in some cases of clinical illness. Throat washings were inoculated into the amniotic sac of 10-to-11-day-old hen eggs, and viruses isolated were typed for final identification by the laboratory of the Tennessee Department of Public Health.

Blood specimens were taken immediately prior to vaccination and again one month later. Serums were separated within 24 hours and stored at −20 C until tested. Hemagglutination-inhibition (HI) tests were performed on these serums by the standard reference technique with chicken red blood cells.[3] Asian influenza virus strain A/Japan/305/57 in the seventh pure-line egg passage was used in these tests.

Results

The first cases of illness suggesting influenza were observed on Oct. 15 and 16, 1957, in four girls in the 10-17-year age group. The onset was sudden, with rise in temperature to 102 F (38.9 C), headache, malaise, myalgia, and cough. They were

TABLE 1.—*Clinical Cases of Influenza Among 168 Orphanage Children by Date of Appearance and of First and Second Doses of Asian Strain Vaccine*

Age Group, Yr. (No. of Children)	Date													Total Cases	
	10/15	10/16	10/19	10/20	10/22	10/23	10/24	10/25	10/26	10/29	10/30	10/31	11/ 8	No.	%
1-3 (22)															
Dose no.		1						2							
No. of cases	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-6 (40)															
Dose no.		1						2							
No. of cases	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-10 (58)															
Dose no.					1						2				
No. of cases	0	0	0	0	0	0	0	0	0	2	1	4	0	7	12.1
10-17 (48)															
Dose no.			1						2						
No. of cases	4	0	0	2	0	6	3	2	1	0	0	0	1	19	39.6

Only 13 of the total population of 168 children failed to receive the two doses of vaccine. Of these, four had the original cases of illness in the 10-17-year age group, becoming ill Oct. 15-16; five were in children in the older age groups who became ill after their first dose of vaccine and were not given the second dose; and four were children who escaped vaccination due to circumstances beyond control. All of the orphanage personnel, except one maid, were given similar vaccine from another source at the same time the children were vaccinated. Children newly admitted to the orphanage were vaccinated as they arrived.

Clinical Follow-up Study.—Clinical observations were made daily by the pediatrician (L. C. W.) during the period of study, which was from Oct. 15, 1957, to Nov. 25, 1957, although clinical observation was carried out beyond this period. In addition to noting evidences of clinical disease, attention was given to both systemic and local reactions to the vaccine. The local reactions were recorded after 24 hours, again at 3 or 4 days, at 7 days, and, finally, at 30 days after vaccination.

not observed to have coryza or red throats. No virus isolations were attempted on these children; however, serologic findings were indicative of Asian influenza, showing at least a fourfold rise in the HI titer. These initial cases occurring in the orphanage corresponded in occurrence to a widespread outbreak in the city of Memphis. Unpublished data on absenteeism among school children collected by Dr. Nobel W. Guthrie of the Memphis-Shelby County Health Department indicate that this community outbreak of influenza began about Oct. 14-15 and reached a peak about Nov. 4, 1957.

Vaccinations were begun on the younger children in the orphanage on Oct. 18, after the occurrence of the above cases, and all of the other children and personnel received their first immunization by Oct. 22. The second doses of vaccine were given between Oct. 25 and 30. Thus, the entire orphanage population, with the minor exceptions noted previously, was protected by vaccination, but not until after clinical cases of influenza had appeared in the older group and in the community. Table 1 shows the dates of vaccination and the occurrence of clinical cases of influenza among children in each age group.

Seventeen clinical cases of influenza occurred between the first and second doses of vaccine. These were in 12 girls and 1 boy in the 10-17-year group. Three were so mild that they would not have been called influenza in the absence of the outbreak. Another boy in the 10-17-year group had been newly admitted and received the first dose of vaccine four days before developing influenza. Also, three girls in the 6-10-year age group became ill after the first dose of vaccine. Throat washings were collected on 11 of these 17 children, and 7 of these yielded Asian strain influenza on isolation.

Five cases of influenza occurred after the second dose of vaccine. Four of these five cases occurred the day after the second dose, and these were among children in the 6-10-year group. Two girls and two boys were ill. One girl and one boy were so mildly ill that their illnesses would not have been called influenza in the absence of the epidemic. Asian influenza virus was isolated from both of these.

The fifth case occurring after the second dose of vaccine was in a boy in the 10-17-year age group who became ill on Nov. 8, 1957. His case represents the last illness observed in the orphanage and the persons were in constant association with the infants and younger children during their own illnesses, which occurred in late October after they had received their second dose of vaccine.

It is also noteworthy that the children in the 3-6-year age group had been under intensive observation during a special study of respiratory diseases for 10 months prior to and concurrent with the present study. None of these developed disease which could be considered to be even mild or atypical influenza, although some did show rhinitis with cough, fever, or malaise. These illnesses were no different from numerous such episodes experienced during the year. In fact, this group was remarkably free of all respiratory symptoms during the period of the present study. Although no definitive data are available regarding the incidence of clinical influenza among children under 6 years of age in the population of the city during the epidemic, it is our opinion, and that of pediatricians practicing in the community, that this age group was not spared from attack.

The duration of illness in the first cases observed was three to five days, usually three days, with the height of febrile response on the second day. It has

Table 2.—*Local Reaction to Intradermally Given Influenza Vaccine*

	1st Dose						2nd Dose					
		Reaction* After 24 Hrs., No.				Papules† Present After 1 Wk., No.		Reaction* After 24 Hrs., No.				Papules† Present After 1 Wk., No.
Age Group, Yr.	No. of Children	0	1	2	3		No. of Children	0	1	2	3	
1-3	22	0	13	9	0	0	20	0	7	12	0	8
3-6	40	0	15	22	3	0	39	0	17	18	4	14
6-10	58	0	17	25	16	7	55	0	20	26	9	24
10-17	45	0	7	15	23	0	41	0	8	11	22	7
Total	165	0	52	71	42	7	155	0	52	67	36	53

* 0 = No redness, no induration; 1 = pink, slight induration up to 15 by 15 mm.; 2 = red, indurated up to 25 by 20 mm.; 3 = red, induration greater than 25 by 20 mm.

† More than temporary induration, persisting as small nodule with brownish pigmentation.

only case occurring after the second dose of vaccine was presumed to be effective. This case was very mild, with rise in temperature to 102.8 F (39.3 C), and lasted only 36 hours. Virus was not isolated from a specimen taken during his illness.

The influenza morbidity for each age group revealed that 19 of 48 children (39.6%) in the 10-17-year group, 7 of 58 (12.1%) in the 6-10-year group, and none in the two younger age groups (1-3 and 3-6 years) became ill. It is important to note that the younger children were known to have been exposed to influenza even though no clinical influenza developed among them. One of the older girls in the 10-17-year age group, who became ill on Oct. 15, and another girl of this group, who became ill on Oct. 24, until they exhibited severe clinical manifestations of illness bathed and dressed the younger children each evening. Also, two other adults in charge of the preschool-aged children developed mild clinical influenza confirmed by serologic evidence of Asian strain virus. These already been noted that 5 of the 26 cases were of such a mild character that the diagnosis of influenza would probably not have been made in a nonepidemic year. In fact, no cases were considered severe, and no complications occurred. Immunization may have contributed to this.

There were only 6 systemic reactions to the antigen out of 320 immunization procedures. Four of these were after the first dose and two after the second. These consisted of malaise, anorexia, headache, and temperature rise to less than 100 F (37.8 C), with a duration of less than 24 hours. None of the children was known to be sensitive to eggs, and no immediate local protein reactions were seen, although some were observed in a group of medical students receiving the same antigen intradermally. Careful attention was given to the long-term effects of the local injection of the vaccine because of the persistence of the papule formed by the vaccine and the fact that this sometimes developed a brownish pigmentation which

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might cause concern from a cosmetic standpoint. The extent and character of these reactions are presented in table 2. These papules generally disappeared by six weeks, but the pigmentation persisted in some children at least up to three months and was usually about 3 to 5 mm. in diameter. In no case was it considered a contraindication for the use of the vaccine by the dermal route. It is evident from these data that the older children are apt to develop a more severe temporary reaction. Formation of pigmented papules has not been observed by one of us (L. C. W.) in persons receiving influenza vaccine intradermally from other sources.

The results of the HI tests performed on the youngest three age groups (1-3, 3-6, and 6-10) are presented in table 3. The 10-17-year age group is not included because of difficulties beyond our control in obtaining specimens. Since the illnesses had all occurred before the second dose of vaccine could be expected to be effective, the seven children in the 6-10-year age group with influenza are presented separately in the table from the others who did not become ill. The prevaccination titers were negative in all children in a 1:5 dilution, except for a single patient in the 6-10-year age group whose titer was 1:10. Postvaccination titers were not high but did show the effect of antigenic stimulation. A considerable number (92.7% of the total group) showed a twofold or greater rise in antibody titer, and 55.2% showed a fourfold or greater rise. The 6-10-year age group showed a greater response than either of the two younger age groups with regard to a fourfold or greater rise.

Comment

The pattern of the Asian influenza outbreak among these 168 orphanage children seems to have been influenced by the concurrent administration of the two doses of homologous virus vaccine given intradermally. The following points seem to suggest this.

First, both clinical and serologic evidence indicate that no Asian strain influenza had occurred in the children under 10 years of age up to the time they received the first dose of vaccine.

Second, a very large portion of all children showed at least a twofold rise in HI antibody titer by three weeks after the second dose. Among the children of the 6-10-year age group who did not develop clinical influenza, 78.7% showed at least a fourfold rise in HI antibody titer after receiving the second dose of vaccine. The fourfold or greater rises in HI antibody titer among the 1-3-year and 3-6-year age groups was 20.8 and 33.3% respectively. Since clinical influenza occurred in the 6-10-year age group, it is possible that inapparent infections may have contributed to the higher conversion rate or, possibly, the older children responded better in production of antibody. Conversely, children in the younger age groups either produced antibody poorly or did not have inapparent infections.

Third, the outbreak in the orphanage began in the older children Oct. 15-16, the exact time of the beginning of the epidemic in the city. A total of 19 cases (39.6%) occurred in children in the 10-17-year age group, and all but a single case occurred before the second dose of vaccine was given. The next younger age group experienced clinical influenza after it had subsided in the older age group. A total of seven (12.1%) in the 6-10-year age group were affected, and again the cases all occurred before the second dose of vaccine could become effective. No cases occurred in the two youngest age groups, 1-3 and 3-6 years of age, even though there was known contact with children with clinical cases who were harboring the virus.

TABLE 3.—*Increase in Hemagglutination Antibody Titer and Geometric Mean Titer to Asian Strain Influenza in Orphanage Children Three Weeks After Second Intradermal Dose of Homologous Vaccine*

Age Group, Yr.	No. of Children	Rise in Titer: 2-Fold or Greater, No.	2-Fold or Greater, %	4-Fold or Greater, No.	4-Fold or Greater, %	Mean Titer*
1-3	24	22	91.7	5	20.8	5.35
3-6	18	15	83.3	6	33.3	4.82
6-10						
Not ill	47	45	95.7	37	78.7	9.62
With influenza	7	7	100.0	5	71.4	12.69
Total	96	89	92.7	53	55.2	

* Reciprocals of mean titer. 0 equals <1:5, lowest dilution tested. Prevaccinal titers were all <1:5 with 1 exception.

Fourth, the epidemic in the city continued among school children, and the peak of the epidemic was reached about Nov. 4, 1957, and tapered off subsequently. All cases in the orphanage occurred between Oct. 15 and 31, except for a questionable single mild case on Nov. 8, 1957. It would appear, then, that the orphanage outbreak had substantially ceased before the citywide epidemic had reached its peak.

Interest in the intradermal route for vaccination of children against influenza was heightened during the recent Asian influenza epidemic primarily because of shortage of vaccine and the fact that children tend to exhibit reactions to large doses of vaccine given subcutaneously. The efficacy of the intradermal route for immunization against other diseases has been pointed out in the past, and it was considered important to reevaluate this method of injection in influenza.[3] Some studies have shown

that the antibody response to 0.1 or 0.2 ml. of vaccine given intradermally as a single dose or in two doses of the same amount given approximately one week apart compares very favorably with 0.5 to 1.0 ml. given subcutaneously.[4] Others [5] indicate that this may not be the case. The recent studies of McCarroll and Kilbourne [6] suggest that the division of the vaccine into two doses given one week apart subcutaneously will induce an antibody response superior to that of a single injection by the same route containing the same total dose. They also compared 0.1-ml. and 0.2-ml. doses by both intradermal and subcutaneous routes and found the latter route at least equal in antigenic efficiency. This would seem to indicate that the timing of the injections may be more important than the route of inoculation of small dosages. This important observation deserves further study. Davenport,[7] noting the failure to produce over 10 million doses of vaccine for civilian use prior to the epidemic peak of Asian influenza in 1957, suggests that reliance can not be placed on strain-specific vaccine and a second approach, namely, a panvalent vaccine, may achieve our objectives to control influenza.

Glazier [8] has recently reported immunization against influenza in children to be effective in the face of an epidemic. Of particular interest in relation to the present study are his group-3 cases. None of 241 children in this group who received 0.03 ml. of influenza A and B vaccine intradermally, followed within seven days by 0.5 ml. given subcutaneously, just prior to or at the beginning of the epidemic developed influenza. Of 61 children in the same group who received only the initial dose, 7 developed influenza. In his control group of 122 unimmunized children, 21 had moderate or severe influenza during the epidemic.

Our observations on the course of the influenza outbreak in an orphanage, presented here, appear to indicate that the intradermal route was effective in preventing the spread of the disease to younger age groups, although other factors may possibly have played a role. Our experience justifies continued use of the intradermal route in children and further studies of its effectiveness in older age groups.

Summary

Homologous Asian strain influenza vaccine was given intradermally in two 0.1-ml. doses one week apart to 168 orphanage children from 1 to 17 years of age during the early phase of an outbreak of Asian influenza. All clinical cases of influenza occurred before the second dose of vaccine could become effective, except for a questionable mild case which occurred later. The cases were confined to the older children, with 40% of those in the 10-17-year age group and 12% of those in the 6-10-year age group becoming ill. No cases occurred among the children under 6 years of age. Hemagglutination-inhibition titers were studied on prevaccinal and postvaccinal serum samples, and reactions to the vaccine were noted. The data appear to substantiate the effectiveness of intradermal vaccination against influenza in children in an epidemic situation.

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EXPERIENCES WITH GENERAL ANESTHESIA IN PATIENTS WITH FAMILIAL DYSAUTONOMIA

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The syndrome familial dysautonomia includes a combination of congenital abnormalities and clinical manifestations that make a patient a poor candidate for general anesthesia. Striking features are indifference to pain and diminished lacrimation, which predispose to corneal ulceration, and poor vasomotor control, which predisposes to hypertension during emotional crises and to hypotension during anesthesia. Three cases are described in detail. Among eight patients in whom this syndrome was observed, severe hypotension during anesthesia occurred six times and cardiac arrest twice. When this condition is suspected, a complete preoperative evaluation is needed. Patients who have this condition do not tolerate thiopental sodium or tribromoethanol as anesthetic agents. If local anesthesia after premedication with chlorpromazine is not suitable, the alternative is premedication with chlorpromazine and belladonna drug followed by a volatile general anesthetic.

Since 1949, when familial dysautonomia was described by Riley and co-workers,[1] eight patients with this disease have been anesthetized for 27 surgical procedures at the Columbia–Presbyterian Medical Center. The morbidity from the anesthesia in these patients was high. The difficulties in providing anesthesia safely were serious. Since the disease is rare and the opportunities to administer anesthesia unusual, a review of the problems presented and the details of anesthetic management appeared desirable.

Diagnosis

Familial dysautonomia is a congenital condition frequently seen in siblings and characterized by specific disturbances of the nervous system. The most striking clinical manifestations are associated with aberrations in autonomic nervous system function. All responses to sensory stimuli appear to be either particularly exaggerated or absent. Almost all of the reported patients are small in stature and undernourished. The age at which they have been seen has rarely exceeded 20 years, the majority ranging from 1 to 12 years of age. Many deaths have occurred in the first two to three years of life, but many such patients appear capable of indefinite survival. The oldest currently is 27 years of age.

Table 1 outlines the salient features of the disease.[2] Certain characteristics are more pertinent to the anesthetic management and bear emphasis. Among the disorders of the autonomic nervous system, peripheral vascular dysfunction is prominent. These patients exhibit skin blotching with excitement or ingestion of food. Hypertension in response to emotional stimuli is usually, though not always, present.

Normal individuals show a slight rise in both systolic and diastolic pressures when changing from the supine to the erect posture. In contrast, these patients show a fall in systolic and an even more striking fall in diastolic pressure during the same change in posture. All of the reported patients have exhibited postural hypotension.[3]

Especially in the early years, bronchopneumonia and atelectasis are apt to occur. Moloshok and Moseley [4] believe this is a consequence of excessive mucoid secretions. According to Riley,[2] however, a poor swallowing reflex with aspiration of food or secretions probably is an important contributing factor. As the children grow older, pulmonary complications tend to diminish.

Poor temperature control is another feature of the disease, and even mild infections are accompanied by high fevers. At times, bouts of elevated temperature occur with no overt evidence of infection. Fever and the vomiting which is characteristic of the syndrome often complicate the postoperative period.

The sensory disturbance of importance is indifference to pain. This is not true anesthesia, since the patients can readily identify pin prick. It represents a lack of awareness of discomfort. The diminished lacrimation and corneal anesthesia which are present contribute to the frequency of corneal ulceration. Healing of corneal ulceration is slow and often requires surgical creation of intermarginal lid adhesions.[5] Other characteristics of the disease include poor muscle coordination with absent or hypoactive deep tendon reflexes, dysarthria,

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emotional lability, and drooling beyond the usual age. Death usually occurs after infection or aspiration of vomitus.

There is no satisfactory treatment at the present time. Prefrontal lobotomy, electroshock, tentorial splitting, and lumbar sympathectomy have all failed. Chlorpromazine has proved useful for the treatment of prolonged vomiting. If given at the onset of an attack in combination with phenobarbital, the vomiting is often stopped and the period of disability seems shortened.

Thirteen postmortem examinations have been reported without evidence of consistent or characteristic abnormalities of the central nervous system.

TABLE 1.—*Clinical Features of Familial Dysautonomia*[*]

Disturbances of autonomic nervous system	
Reduced or absent tears when crying	+++
Peripheral vascular disturbances	
Hypertension with excitement	++
Skin blotching	++
Cold hands and feet	+++
Excessive perspiration	++
Erratic temperature control	+++
Disturbed swallowing reflex	+++
Diarrhea or constipation	±
Drooling	++
Disturbances of voluntary neuromuscular system	
Absent or hyposective deep tendon reflexes	++
Poor motor coordination	+++
Dysarthria	+++
Muscular imbalance	
Scoliosis	+
Difficulty walking on heels	++
Convulsions	±
Abnormal electroencephalogram	++
Sensory disturbances	
Relative indifference to pain	+++
Corneal anesthesia	++
Dysesthesia	++
Proprioceptive disturbances	+
Psychological disturbances	
Apparent reduction in intellectual capacity	++
Breath holding spells in infancy	+++
Periodic spells of vomiting	+++
Emotional lability of severe degree	+++
Disturbances not directly involving central nervous system	
Corneal ulceration	+
Frequent bronchopneumonia	++
Retardation of growth	++
Increased tendency to bodily injury	++
Allergic manifestations	±
Factors suggesting genetic origin	
Jewish extraction	+++(?++++)
Occurrence in siblings	++(25-33%)
Consanguinity of parents	+
Occurrence in related families	+
Occurrence in forebears	0

[*] From Riley.[3] Key: 0 = not seen in any cases so far known; ± = seen in some cases, but not frequently enough to be remarkable; + = occurs more frequently than expected in the general population, but still not common; ++ = occurs frequently, but not so regularly as to be required for diagnosis; +++ = probably present in all cases, though future experience may reveal exceptions.

Three showed brain lesions, one had a thalamic cyst destroying the dorsal medial nucleus, one had marked degenerative changes in the reticular substance of the pons and medulla, and one had multiple brain abscesses.[6] Psychiatric studies reveal a behavior pattern most closely resembling that of children who suffer from diffuse organic disorders of the brain.[7] To account for the widespread central and peripheral involvement, Riley [3] and others have postulated a fundamental enzyme disturbance in the nervous system as the causative factor.

Analysis of Cases

Eight patients ranging in age from 9 months to 12 years received general anesthesia 27 times for a variety of surgical procedures (table 2). Preanesthetic medication with a belladonna derivative alone was administered in 11 cases, an opiate combined with belladonna in 4, barbiturate and opiate with belladonna in 5, barbiturate with belladonna in 2, chlorpromazine combined with an opiate and belladonna in 1, and chlorpromazine combined with a barbiturate and belladonna in 1. In the remaining three cases no premedication was used.

Different anesthetic agents were tried. Tribromoethanol (Avertin) alone was used three times, and tribromoethanol followed by diethyl ether was used five times. Vinyl ether followed by diethyl ether was administered twice, cyclopropane followed by diethyl ether in two cases, and ethyl chloride followed by diethyl ether twice. Diethyl ether was given alone in six cases, thiopental sodium followed by nitrous oxide-oxygen in four, tribromoethanol followed by thiopental sodium and nitrous oxide-oxygen in one, thiopental sodium alone in one, and open insufflation of cyclopropane in one.

Complications during anesthesia were frequent and related specifically to the cardiovascular system. Severe hypotension occurred six times, once requiring cancellation of the operative procedure. Hypotension resulted in two instances of cardiac arrest, with successful resuscitation by cardiac massage and efficient ventilation with oxygen.

The most prominent postoperative complication was pulmonary. Bronchopneumonia was present five times in this series, accompanied twice by atelectasis. Two patients exhibited cyanosis during the recovery from anesthesia. There were three patients who developed the cyclic vomiting and spiking temperatures characteristic of this disease. The following three case reports are described in detail to illustrate the cardiovascular collapse which may occur.

Report of Cases

CASE 1.—An 18-month-old girl, weighing 12 lb. (5.4 kg.), had the characteristic clinical signs of familial dysautonomia. She was undernourished and dwarfed and had frequent bouts of vomiting and bronchopneumonia and a labile hypertension. An arthrogram was scheduled to establish the diagnosis of congenital hip dysplasia. On two previous occasions the procedure was canceled because of persistent bronchopneumonia. On this occasion a preoperative chest film showed normal findings. Scopolamine, 0.2 mg., was given one hour before operation. The patient arrived in the operating room with a dry mouth and was crying. After a cutdown incision for intravenous cannulation was performed with use of local anesthesia, 2 cc. of a 1.25% solution of thiopental sodium was injected intravenously. A mask was applied, and a mixture of 60% nitrous oxide and 40% oxygen was administered through a nonrebreathing system. A metal oral airway was inserted after 12.5 mg. more of thiopental sodium had been given. The patient coughed twice and became apneic, although the airway was clear and the chest easily inflated. The pulse slowed to 10 beats per minute, and the blood pressure could not be measured. Positive pressure oxygen was given by mask, and ephedrine (5 mg.) was in-

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TABLE 2.—*Results of General Anesthesia in Eight Patients with Familial Dysautonomia*

Case No.	Age at Operation, Yr.	Symptoms	Operation	Premedication	Anesthetic Agent	Complications	
						Anesthetic	Postoperative
1	2	Hypertension, pulmonary symptoms	Arthrogram	Scopolamine, 0.2 mg.	Thiopental sodium, nitrous oxide-oxygen	Hypotension	Cyclic vomiting, aspiration pneumonia
2	7	Hypertension	Myelogram	Morphine sulphate, 3 mg.	Tribromoethanol (Avertin), 100 mg./kg. of body weight	None	None
			Correction of varus deformity of right foot	Meperidine (Demerol), 40 mg., scopolamine, 0.2 mg.	Cyclopropane, nitrous oxide-oxygen, ether	None	Cyanosis in recovery room
3	1½	Pulmonary symptoms	Suture of tongue	Chlorpromazine (Thorazine), 10 mg., secobarbital (Seconal), 15 mg., scopolamine, 0.2 mg.	Vinyl ether (Vinethene) nitrous oxide-oxygen	Labile pulse	None
4	6	Hypertension, pulmonary symptoms	Stellate block	None	Cyclopropane	None	None
			Creation of lid adhesions	Secobarbital, 60 mg., scopolamine, 0.25 mg.	Vinyl ether	None	None
	7		Lysis of adhesions	Secobarbital, 60 mg., scopolamine, 0.2 mg., morphine sulphate, 3 mg.	Tribromoethanol, 30 mg./kg. of body weight, ether	None	None
5	4½	(Normotension, no pulmonary symptoms)	Creation of lid adhesions	Atropine, 0.1 mg.	Ethyl chloride, ether	None	None
	5½		Lysis of adhesions	Meperidine, 30 mg., scopolamine, 0.2 mg.	Tribromoethanol, ether	None	None
6	9	Hypertension, pulmonary symptoms	Topectomy	Morphine sulphate, 7 mg., scopolamine, 0.3 mg.	Tribromoethanol, 70 mg./kg. of body weight, thiopental sodium, nitrous oxide-oxygen, meperidine	Hypotension, cardiac arrest	Bronchopneumonia with atelectasis, cyclic vomiting
	10		Lobotomy	Amobarbital (Amytal), 100 mg., meperidine, 50 mg., scopolamine, 0.3 mg.	Thiopental sodium, vinyl ethyl-ether, nitrous oxide-oxygen	Hypotension	Bronchopneumonia with atelectasis
7	6	(Normotension, no pulmonary symptoms)	Creation of lid adhesions	Meperidine, 25 mg., chlorpromazine, 10 mg., scopolamine, 0.2 mg.	Cyclopropane, nitrous oxide-oxygen, ether	None	None
8	¾	Hypertension, pulmonary symptoms	Creation of conjunctival flap	Atropine, 0.1 mg.	Ether	None	Bronchopneumonia
	1		Release of conjunctival flap	Atropine, 0.1 mg.	Ether	None	None
	2		Creation of lid adhesions	Atropine, 0.1 mg.	Ether	None	None
	2½		Release of adhesions	Atropine, 0.1 mg.	Ether	None	None
	3		Creation of adhesions	Atropine, 0.1 mg.	Ether	None	None
	3		Creation of lid adhesions	Atropine, 0.1 mg.	Tribromoethanol, 100 mg./kg. of body weight, ether	None	None
	4		Inversion of eyelashes	Atropine, 0.2 mg.	Tribromoethanol, 100 mg./kg. of body weight	None	None
	4½		Bronchoscopy, bronchography	None	Ethyl chloride, ether	None	Hypotension, cyanosis
	4½		Tonsillectomy, adenoidectomy	Secobarbital, 30 mg., scopolamine, 0.2 mg.	Ether	None	None
			Division of tentorium	Scopolamine, 0.1 mg.	Ether, thiopental sodium, nitrous oxide-oxygen	Hypotension throughout	Febrile for 10 days
	5		Creation of adhesions	None	Thiopental sodium	None	None
	5		Creation of lid adhesions	Atropine, 0.1 mg.	Tribromoethanol, 95 mg./kg. of body weight, ether	None	None
			Creation of lid adhesions	Secobarbital, 45 mg., codeine, 45 mg., scopolamine, 0.2 mg.	Tribromoethanol, 95 mg./kg. of body weight	None	None
	10		Superficial keratectomy	Secobarbital, 50 mg., morphine sulphate, 5 mg., scopolamine, 0.4 mg.	Tribromoethanol, 50 mg./kg. of body weight, nitrous oxide-oxygen, ether	Hypotension	None
	12		Superficial keratectomy	Secobarbital, 100 mg., morphine sulphate, 9 mg., scopolamine, 0.3 mg.	Thiopental sodium, succinylcholine, nitrous oxide-oxygen	Cardiac arrest	Pleural effusion, pneumonia, cyclic vomiting

jected intravenously. Within a few moments the blood pressure returned to hypertensive levels, the pulse rate accelerated to 160 per minute, and spontaneous respirations resumed. The procedure was abandoned, and the patient returned to bed fully responding. On the first postoperative day, she aspirated a feeding and developed a complete atelectasis of the right lung. Endotracheal intubation followed by adequate tracheobronchial aspiration produced complete reexpansion of the lung, and she made an uneventful recovery. One month later this patient developed a corneal

ulceration. Intermarginal lid adhesions were produced during local anesthesia. Chlorpromazine (5 mg.) was used for premedication.

Case 6.—A 9-year-old girl, weighing 50 lb. (22.7 kg.), had hypertension, pulmonary symptoms, and cyclic vomiting. In addition she exhibited severe emotional instability. A topectomy was contemplated. Premedication consisted of morphine sulphate, 7 mg., and scopolamine, 0.3 mg., given one and one-half hours before operation. She arrived in the operating room awake and apprehensive. Tribromoethanol, 1.6 Gm. (70 mg. per kilogram of body weight), was given rectally and partially expelled. After a spray of a 2% solution of tetracaine hydrochloride to the larynx and trachea, endotracheal intubation was performed. The endotracheal tube was connected to a Heidbrink circle filter and a mixture of 60% nitrous oxide and 40% oxygen was administered. Supplementary intravenous injections of a 3% solution of thiopental sodium in increments of 60 mg. and meperidine in 5-mg. doses were given. Hypotension developed during the induction and persisted, with a systolic pressure of 80 mm. Hg, in spite of administration of ephedrine (25 mg. intravenously and 25 mg. intramuscularly) and methamphetamine (Methedrine) (5 mg. intravenously). The blood pressure remained at 80/60 mm. Hg for three hours and then fell to 60/40 mm. Hg. By this time, 900 mg. of thiopental sodium and 40 mg. of meperidine had been given. Methamphetamine (5 mg. intravenously) had no effect, and cardiac arrest occurred. The chest was opened, and cardiac massage produced a prompt return of spontaneous beating. The postoperative course was complicated by a right lower lobe atelectasis which responded to antibiotic therapy.

The patient developed a more tractable personality, but this improvement was temporary. Four months later she was scheduled for bilateral prefrontal lobotomy. Premedication consisted of amobarbital (Amytal) sodium, 100 mg. given one and one-half hours preoperatively, and meperidine, 50 mg., and scopolamine, 0.3 mg., given one hour before operation. She was well sedated without appearing depressed. Sixty milligrams of a 3% solution of thiopental sodium was given. Her respiratory rate slowed to 8 per minute and her pulse to 60. Administration of 100% oxygen with positive pressure brought an immediate return of the pulse rate to 120 and respirations to 20 per minute. An open-drop vinyl ether–diethyl ether sequence followed uneventfully. The patient was intubated, and a mixture of 60% nitrous oxide and 40% oxygen was administered through a nonrebreathing system. Thiopental sodium, 30-to-60-mg. increments of a 3% solution, was added, sufficient to prevent movement of the patient. In three hours a total of 450 mg. was given. The blood pressure ranged from 100/60 to 80/50 mm. Hg, the pulse from 80 to 100 per minute, and the respiratory rate from 15 to 20 per minute. The postoperative course was complicated again by a right lower lobe bronchopneumonia and cyclic vomiting.

Case 8.—A 12-year-old boy, weighing 101 lb. (45.8 kg.), had had 13 surgical procedures with general anesthesia from the age of 9 months until he was 10 years of age. On two previous occasions he developed severe hypotension, once after thiopental sodium administration and once after tribromoethanol and diethyl ether administration. He was scheduled for a superficial keratectomy. Premedication consisted of secobarbital (Seconal), 100 mg. given one and one-half hours preoperatively, and morphine sulphate, 8 mg., and scopolamine, 0.3 mg., given one hour before operation. He arrived in the induction room in an apprehensive state. Thiopental sodium, 150 mg. of a 3% solution and succinylcholine, 40 mg., were given intravenously. Endotracheal intubation was performed after 60 mg. of a 4% solution of cocaine was sprayed into the pharynx and trachea. Anesthesia was maintained with a mixture of 70% nitrous oxide and 30% oxygen administered through a Heidbrink circle filter with an overflow of gas escaping from the system with each breath. Thiopental sodium, 30-to-60-mg. increments of a 3% solution, was used to supplement the nitrous oxide analgesia. A total of 300 mg. had been administered when cardiac arrest occurred suddenly during the operation. There was no detectable preexisting hypotension. The chest was opened and the heart massaged within 60 seconds. Resuscitation was successful, and the patient reacted promptly on discontinuance of the anesthesia. Postoperative cyclic vomiting and a left pleural effusion and pneumonitis were present for one week, followed by complete recovery.

Comment

Patients with familial dysautonomia are grave anesthetic risks. The labile cardiovascular system, frequent bronchopneumonia, hypersalivation with aspiration, hyperemesis, and emotional instability are severe problems for the anesthesiologist.

Preoperative examination must be as complete as possible. In addition to a blood cell count and urinalysis, a chest film is necessary. If cyclic vomiting is present, electrolyte and fluid imbalance must be corrected. Preanesthetic medication with chlorpromazine, 0.5 mg. per pound, is proving valuable both as an emotional stabilizer and as prophylaxis against postoperative vomiting. Enough barbiturate (0.5 mg. per pound) and narcotic (0.05 mg. per pound of morphine or 0.5 mg. per pound of meperidine) should be added to insure a well-sedated patient on arrival in the operating room. The use of a belladonna drug has been questioned by some because of the tendency to thicken bronchial secretions and possibly contribute to atelectasis. However, adequate doses of atropine or scopolamine diminish salivation and provide for smoother induction and maintenance of anesthesia.

The presence of a labile cardiovascular system demands a flawless anesthetic technique with adequate ventilation. Postural hypotension adds to the circulatory problem. Once the patient is anesthetized, positional changes should be avoided if possible. If movement of the patient proves to be necessary, it should be performed very slowly. The blood pressure must be measured frequently to ascertain early hypotensive changes. Hypotension is serious and may be the prelude to cardiocirculatory collapse. Early detection and treatment is essential to prevent complete circulatory failure. Vaspressors, e.g., ephedrine (5 to 25 mg.) and methedrine (2 to 5 mg.), often provide prompt restitution of the blood pressure. Where they fail, a dilute drip of levarterenol (1 to 2 mg. in 500 ml. of a 5% solution of glucose in water) may be tried.

Severe arterial hypotension or cardiac arrest occurred six times in this series. In five of these cases thiopental sodium was given intravenously, and once tribromoethanol per rectum was used. Although ether, vinyl either, or cyclopropane-ether were most frequently used, hypotension was not encountered with these agents. The precise reasons for the difficulties with thiopental sodium and tribromoethanol are unknown.

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With only eight cases analyzed retrospectively, no predictably safe method of anesthetic management has been found. The difficulties encountered with the agents previously used suggest that the volatile agents which can be eliminated rapidly are superior to those which are metabolised. Thiopental sodium and tribromoethanol created difficult problems in management and are avoided now. Since an elevated pain threshold is often present, it is possible to perform minor surgical procedures with use of local anesthesia. Four patients, not included in this series, had minor surgery satisfactorily performed with local anesthesia after premedication with chlorpromazine, a barbiturate, and meperidine. In view of the high morbidity with general anesthesia reported here, local anesthesia reinforced with chlorpromazine and sedatives is suggested wherever practical.

Summary

Eight patients with familial dysautonomia received general anesthesia for 27 surgical procedures. Serious morbidity was high. Severe hypotension occurred six times, leading to cardiac arrest twice. Bronchopneumonia was a frequent postoperative complication. All of the cardiovascular problems were associated with the use of thiopental sodium or tribromoethanol (Avertin). As guides to safer management, the following points are suggested: (1) a complete preoperative evaluation, including chest x-ray, (2) premedication with chlorpromazine and a belladonna drug, and (3) use of the volatile anesthetic agents, if local anesthesia after premedication with chlorpromazine is not suitable.

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TRANQUILLIZERS IN PSYCHIATRY.—There are two groups of drugs, the phenothiazine compounds and the Rauwolfia alkaloids, which have a specific action on some of the symptoms of psychosis. Alone or in combination with other drugs they are effective in acute and chronic psychoses mainly characterized by psychomotor overactivity and excitement. States of depression or stupor either do not respond, or are better treated by other means, such as convulsive therapy or analeptics. The neuroses are no more responsive than to other agents. The phenothiazine compounds are in general more effective than the Rauwolfia alkaloids, although individual patients show marked differences in their responses to one or other of the groups of drugs, and combinations of a phenothiazine compound with reserpine or with another phenothiazine compound, e. g. chlorpromazine and pecazine, may be more effective than either singly. Little can be said at present about specific indications for particular drugs. Their action, like the action of other forms of . . . therapy in psychiatry, cuts across diagnostic categories. The most effective dose of both groups is reached at a level where they cause motor slowing and rigidity: a level when Parkinsonian symptoms are appearing. Parkinsonian symptoms can be controlled in some cases with anti-Parkinsonian drugs if it is necessary to maintain a high dosage level. Usually the dose can be reduced once symptoms are under control, and patients may be discharged from hospital and maintained on quite low doses. When patients are discharged from hospital after treatment with tranquillizers, the burden of their supervision usually falls on the general practitioner, although some hospitals are now starting special maintenance clinics for this purpose. It is clearly important that the practitioner should not only recognize the possibility of toxic symptoms, but should also be aware of the importance of maintenance therapy, which for some patients is as important for the control of psychiatric illness as it is in the case of digitalis for the cardiac patient.—D. M. Leiberman, M.D., and G. F. Vaughan, M.B., Tranquillizers, *The Practitioner*, October, 1958.

THE EDUCATIONAL COUNCIL FOR FOREIGN MEDICAL GRADUATES

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A system of qualification examinations has been developed in order to insure uniformity and fairness in the testing of foreign-trained physicians for admission to internship or residency training in the hospitals of the United States. The Educational Council for Foreign Medical Graduates (ECFMG) gave its first examinations in 1958. These have been modified in the light of accumulating facts, especially as regards language difficulties. The fourth examination, Sept. 22, 1959, will be given not only in the United States but also in over 50 foreign centers. The candidate who passes can safely assume that his knowledge of medicine and command of English are adequate for him to profit by his experience in this country, and an American hospital accepting him can feel assured that he is qualified to render effective service as intern or assistant resident.

The Educational Council for Foreign Medical Graduates (ECFMG) opened its doors Oct. 1, 1957. On March 25, 1958, it held its first American Medical qualification examination; on Sept. 23, 1958, its second examination; and on Feb. 17, 1959, its third examination.

Qualification Examinations

The first qualification examination was given March 25, 1958, to 298 foreign medical graduates who were already in the United States. It was offered in only 17 U. S. medical schools. Of the 298 taking the examination, 152 (51%) attained a score of 75% or better and were granted standard ECFMG certificates. Only one candidate failed to pass the ECFMG English test.

One fact that came out of this first examination was that many of these foreign medical graduates, even after experience in an American hospital, were slow readers of English. Twenty-eight of them failed to finish the morning portion of the examination and left a block of unanswered questions at the end of that session. As the result of this experience, the total number of questions was reduced from 400 to 360 and an additional time allowance of 30 minutes was added.

The second examination, on Sept. 23, 1958, was given to 844 candidates in about 30 U. S. medical schools and in about 30 examination centers set up in foreign countries with well-instructed American-national proctors in charge.

Of the 844 foreign medical graduates who took this examination, 418 (49.5%) attained a score of 75% or better and were granted standard ECFMG certificates. Of the 844, there were 7 who failed to pass the ECFMG English test and 9 who received a mark of "questionable pass" in it.

This was not too bad a showing for the group as a whole, but further breakdown of the figures showed that for those who took the examination in their home country without ever having had experience in an American hospital, many of them without experience in an English-speaking country, the results were not nearly as favorable. Of the 707 foreign medical graduates taking this examination in the United States, a total of 371 (52.4%) attained scores of 75% or better and 193 (27.3%) attained scores of 70 to 74%. In contrast, of the 137 foreign medical graduates taking the examination overseas only 47 (34.3%) attained scores of 75% or better and only 33 (24.1%) attained scores of 70 to 74%.

Failure to understand English was apparently much more of a stumbling block for the overseas candidate than for the stateside candidate. Of the 137 overseas candidates, 7 failed the ECFMG English test and 3 were listed as "questionable pass." In contrast, of the 707 stateside candidates, none failed the English test and only 6 were listed as "questionable pass."

With all these facts in mind, the ECFMG's Examinations Committee concluded that it would be quite unfair and unwise to exclude from participation in U. S. hospital internship and residency training 65.7% of the foreign-trained physicians applying in their home country, when experience has shown that the majority overcome the language barrier rapidly when once established in a U. S. hospital.

On the recommendation of the Examinations Committee, the Board of Trustees of the ECFMG voted to issue a temporary certificate to those candidates passing the English test and attaining a score of 70 to 74% in the qualification examination. This certificate would be good for admission to

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internship or assistant residency training for a period not to exceed two years. If, within the two years, the candidate does not retake and pass the examination with a score of 75% or better, he would be expected to return to his home country.

Of the 844 candidates taking the second examination, 418 (49.5%) therefore received ECFMG standard certificates and 226 (26.8%) received ECFMG temporary certificates. Eighty (58.4%) of the 137 candidates taking the examination overseas obtained certificates declaring them qualified to undertake hospital training in the United States. Of the overseas candidates, 34.3% won standard certificates and 24.1% won temporary certificates.

The third examination was given Feb. 17, 1959, to 1,772 foreign medical graduates in 33 examining centers in the U. S. and 44 centers overseas.

Of the 1,278 candidates taking the examination in U. S. centers, 616 (48.2%) obtained scores of 75% or better and received ECFMG standard certificates and 341 (26.7%) obtained scores of 70 to 74% and received ECFMG temporary certificates. None of these candidates failed the ECFMG English test, but three were listed as "questionable pass."

Of the 494 candidates taking the examination in the 44 overseas examination centers, 153 (31%) obtained scores of 75% or better and received ECFMG standard certificates and 110 (22.3%) obtained scores of 70 to 74% and received ECFMG temporary certificates. There were in this group 22 failures and 23 listed as "questionable pass" in the ECFMG English test. There was one foreign center in which 3 out of 5 candidates had serious difficulty with the English test and two foreign centers in which approximately 5 out of 10 candidates had serious difficulty with the English test.

Future Examinations

The fourth American medical qualification examination is scheduled for Sept. 22, 1959. Applications and credentials must be in the hands of the ECFMG, 1710 Orrington Ave., Evanston, Ill., no later than June 22, 1959. Examination centers will be activated in the cities listed in the table.

The examinations for 1960 are scheduled as follows: March 16, 1960 (with deadline for application Dec. 16, 1959), and Sept. 21, 1960 (with deadline for application June 21, 1960).

Conclusions

The Educational Council for Foreign Medical Graduates is growing rapidly. The number of candidates given the American medical qualification examination has risen rapidly from 298 on March 25, 1958, and 844 on Sept. 23, 1958, to 1,772 on Feb. 17, 1959. Over 1,000 candidates are already signed up for the examination on Sept. 22, 1959.

Largely because of the language difficulties, the issuance of temporary two-year certificates to those attaining scores of 70 to 74% in the examination has been found necessary. The qualifying examination is now being offered in 34 United States cities and in 52 foreign cities twice each year. Additional centers are in the process of being organized.

U. S. and Canadian Centers

California, Los Angeles	New York, Buffalo
California, San Francisco	New York, New York City
Colorado, Denver	New York, Syracuse
Connecticut, New Haven	North Carolina, Durham
District of Columbia, Washington	North Dakota, Grand Forks
Florida, Miami	Ohio, Cincinnati
Georgia, Emory	Ohio, Cleveland
Illinois, Chicago	Pennsylvania, Philadelphia
Kansas, Kansas City	Pennsylvania, Pittsburgh
Kentucky, Louisville	Tennessee, Nashville
Maryland, Baltimore	Texas, Houston
Massachusetts, Boston	Virginia, Richmond
Michigan, Ann Arbor	Washington, Seattle
Minnesota, Minneapolis	Wisconsin, Milwaukee
Missouri, St. Louis	Hawaii, Honolulu
New Jersey, Jersey City	Puerto Rico, San Juan
New York, Brooklyn	Canada, Montreal

Foreign Centers

Argentina, Buenos Aires	Iran, Tehran
Aruba	Israel, Tel Aviv
Brazil, Rio de Janeiro	Lebanon, Beirut
Chile, Santiago	Pakistan, Dacca
Colombia, Cali	Pakistan, Karachi
Cuba, Havana	Pakistan, Lahore
Ecuador, Quito	Syria, Damascus
Haiti, Port-au-Prince	Turkey, Ankara
Mexico, D.F., Mexico City	Turkey, Istanbul
Nassau	Austria, Vienna
Nicaragua, Managua	Belgium, Brussels
Panama, Panama City	England, London
Peru, Lima	France, Paris
El Salvador, San Salvador	Germany, Bonn
B. C. Colony, Hong Kong	Germany, Frankfurt
India, Bombay	Germany, Munich
India, Calcutta	Greece, Athens
India, Madras	Iceland, Reykjavik
India, New Delhi	Italy, Rome
Japan, Tokyo	Netherlands, The Hague
Korea, Seoul	Portugal, Lisbon
Philippines, Manila	Spain, Madrid
Taiwan, Taipei	Switzerland, Bern
Thailand, Bangkok	Egypt, Cairo
Cyprus, Nicosia	New Zealand, Wellington
Iraq, Baghdad	Yugoslavia, Belgrade

American hospitals accepting as interns or assistant residents the foreign medical graduates who hold either standard or temporary certificates should feel safe in assuming that these candidates are bona fide physicians who have had a minimum of 18 years of formal training, at least 4 of the years in a recognized medical school, and that their knowledge of medicine and their command of English are ample to enable them to serve effectively as interns or assistant residents.

1710 Orrington Ave.

LIPID STUDIES IN HEALTH AND DISEASE

PRELIMINARY REPORT OF THE RESULTS OF LIPID DETERMINATIONS IN A GROUP OF NORMAL MALE OFFICERS AND PATIENTS WITH VASCULAR DISEASES

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In an effort to determine the diagnostic and prognostic value of certain laboratory data in atherosclerosis, values obtained from 294 normal healthy male officers were compared with values obtained from 205 patients with myocardial infarction, 101 with angina, 77 with arteriosclerosis obliterans, 99 with hypertensive cardiovascular disease, and 100 under observation for cardiovascular disease. The data concerned total serum cholesterol levels and two lipoprotein fractions. Significant differences between groups were found, but variations from person to person within groups were too great to permit identification and prediction of atherosclerosis in individuals. The serum lipid values of 10 normal persons who subsequently showed severe cardiovascular symptoms (fatal in four cases) were not consistently high. The serum cholesterol level was as informative as data from the more elaborate procedures. When it is high in a patient, the physician should look for other evidence of premature vascular disease.

Recognition of the increasing importance of atherosclerosis as a major cause of death and disability has stimulated extensive investigation in this field during the past decade. Atherosclerosis is no longer regarded as the inevitable result of age or "wearing out" of the arteries but is now considered a disease entity. Autopsy studies suggest that almost all North American adult males have some coronary artery atherosclerosis and that this process can begin early in adult life and may often exist in an occult form for years before recognizable clinical manifestations appear.[1]

Cholesterol is the chief chemical constituent in the atheromatous plaque, the pathological hallmark of atherosclerosis. The pathogenesis or mechanism of atherogenesis is not known, and the question has been a subject of widespread speculation and international research. Among the many causes and predisposing factors considered have been heredity; type of vascular construction; injury to the vascular wall by infection, trauma, stress, and increased vascular tone and intravascular pressure; faulty enzymatic activity in lipid metabolism; or a basic abnormality in lipid metabolism based on faulty diet.

The frequent finding of a high concentration of serum cholesterol in persons with atherosclerosis and the production of experimental atherosclerosis in laboratory animals by feeding them high cholesterol-lipid diets have suggested that there is an etiological relationship between a defect in lipid metabolism and human atherosclerosis. Epidemiologic studies of sample populations have statistically suggested that an association exists between high-fat diets and higher serum cholesterol levels and a high incidence of atherosclerosis. These combined observations have provided an indirect method of study which only furnishes information about groups of persons and may or may not apply to a particular person whom we may wish to evaluate in terms of absence or presence of atherosclerosis or susceptibility to this condition.

One important phase now under investigation, evaluation, and debate is the relationship of cholesterol and other lipids to atherosclerosis and the part they play as possible etiological or predisposing factors, indicators of existing disease, or predictors in persons who may be susceptible to this disease. The potentialities of a method or a blood measurement for the early identification of persons with atherosclerosis or a predisposition to this disease attracted the attention of military physicians whose primary responsibility is selecting the physically fit and maintaining the health of military personnel.

The present study was initiated at Walter Reed Army Hospital early in 1951 with the assistance of the department of pharmacology of the Walter Reed Army Institute of Research. Its aim was to evaluate the reliability of the various methods of lipid determinations in identifying and predicting atherosclerosis, especially coronary atherosclerosis. Measurements giving promise of value at that time were (1) serum cholesterol concentration,[2] (2) serum

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phospholipid concentration,[5] (3) serum cholesterol-phospholipid ratio,[6] (4) serum lipoprotein concentration determined by ultracentrifugation,[7] and (5) measurements of beta-lipoprotein.[8]

The study was designed to measure the serum cholesterol and serum lipoprotein concentration values in normal healthy male career officers in various age groups, in male patients with presumptive atherosclerosis with such diagnoses as myocardial infarction, angina, and arteriosclerosis obliterans, and in patients with vascular diseases, such as arterial hypertension, which are known to predispose toward atherosclerosis.

The immediate objectives were (1) to obtain values for normal adult males in various age groups, (2) to ascertain the nature of the variability and/or stability of these measurements in the normal person, (3) to determine if one of these tests adequately distinguished the person with proved atherosclerosis from the normal subject, thereby giving promise of being usable as a blood parameter by which those susceptible to the disease could be separated from normal persons, and (4) to determine if one of these blood parameters was suitable and practical as part of the routine physical and periodic health examinations in military personnel.

The long-term objective of these studies is to ascertain by follow-up studies and repeated tests given to the normal group whether a measurement in early life is of predictive value in regard to the future development of atherosclerosis. The future health records of the selected subjects will be carefully scrutinized and all new events noted, especially the cardiovascular and metabolic disorders which become apparent. The present preliminary report deals chiefly with the results of the short-term evaluations and recommendations for future studies.

Material and Methods

Three groups comprising 100 male duty officers each, aged 25 to 34, 35 to 44, and 45 to 59 years, were selected as normal subjects. The criteria for normality consisted of a negative history of any symptoms or findings of cardiovascular and systemic diseases, normal cardiovascular findings on careful examination, including the peripheral arterial blood pressure and pulse rates, a 12-lead electrocardiogram with the subject at rest, and a roentgenogram of the heart and great vessels, and normal urinary findings. The cholesterol level was satisfactory in 294, and lipoprotein values were satisfactory in 292 of the 300 officers who entered the study.

The patient material consisted of 200 consecutively hospitalized patients with proved acute or convalescent myocardial infarction due to coronary atherosclerosis. In addition, there were 100 with clinical angina not complicated by a manifest myocardial infarction, 75 with arterial insufficiency of the lower extremities with clinical features of arteriosclerosis of the peripheral vessels, 100 with hypertensive cardiovascular disease who did not have clinical evidence of associated coronary disease, and 100 who were observed for coronary disease but in whom such a diagnosis was not confirmed after a period of clinical evaluation. An additional 300 patients were studied who had miscellaneous types of cardiovascular and systemic diseases, but these are not included in this evaluation.

The venous blood specimens were collected in a dry syringe early in the morning with the patient in a fasting state. All analyses on each serum specimen were completed within 30 days. Control experiments indicated that, in the absence of gross contamination by micro-organisms, no change in lipoprotein concentration occurred on storage of serum at 1 to 3 C for this period of time. Total cholesterol level was determined by the Sperry and Webb[9] modification of the Schoenheimer-Sperry procedure.

Ultracentrifugal analysis of lipoproteins by flotation at a density of 1.063 was carried out as previously described.[7] Ultracentrifugation at a density of 1.21 was carried out by a modification of the

TABLE 1.—*Serum Cholesterol and Lipoprotein Values in Normal Officers and Patient Groups*

	Cholesterol Level			Lipoprotein Levels					
	No. of Subjects	Mg./100 Cc.		No. of Subjects	Sf 12-20 Mg./100 Cc.		Sf 20-100 Mg./100 Cc.	
		Mean	S. D.*		Mean	S. D.*	Mean	S. D.*
Normal	294	250.6	61.35	292	22.2	17.44	81.9	66.27
Myocardial infarction	205	287.9	65.70	204	44.4	28.23	112.4	97.62
Angina	101	288.4	69.19	101	40.5	29.74	110.5	104.60
Arteriosclerosis obliterans	77	280.5	65.66	59	41.4	22.30	116.6	112.60
Hypertensive cardiovascular disease	99	275.2	60.92	98	28.1	20.20	84.3	74.76
Observation for cardiovascular disease	100	248.9	59.69	100	37.1	22.80	91.2	103.16

* S. D. = Standard deviation.

methods of Lewis and Page,[6] de Lalla and Gofman,[6] and Boyle and associates.[10] Preparative ultracentrifugation was carried out in a potassium bromide-sodium chloride medium, density 1.21, at 16 C for 18 hours at 52,640 rpm in the J rotor of the Spinco model E ultracentrifuge. The top fraction was removed with a tube slicer and analyzed at 56,100 rpm in a model AD analytical rotor with use of a six-minute acceleration time which was considered equivalent to two minutes at full speed. The ultracentrifugation in all cases was performed to concentrate the low density lipoprotein with threefold only, rather than fivefold.

Studies were not extended to include S_f (Svedberg flotation unit) 0-12 and S_f 100-400 measurements or to include determination of atherogenic index measurement as made by Gofman and coworkers.[11] Determination of serum lipoproteins by paper electrophoretic techniques was also done on 68 of the normal officers and 77 of the patients with myocardial infarction. The results of these techniques as compared to cholesterol and ultracentrifugal analyses have been reported elsewhere.[12]

Results of Initial Determinations

The mean values for total serum cholesterol and serum lipoproteins for the normal and patient groups are given in table 1. The normal values presented great variations in each age group. The variations of the mean and the individual variations

59 was not significantly different from the values for the other two groups (fig. 1C). This is in agreement with the findings of others.[19] There was no significant difference observed in the mean S_f 12-20 and S_f 20-100 lipoprotein values for the three age groups of normals (fig. 2C and 3C).

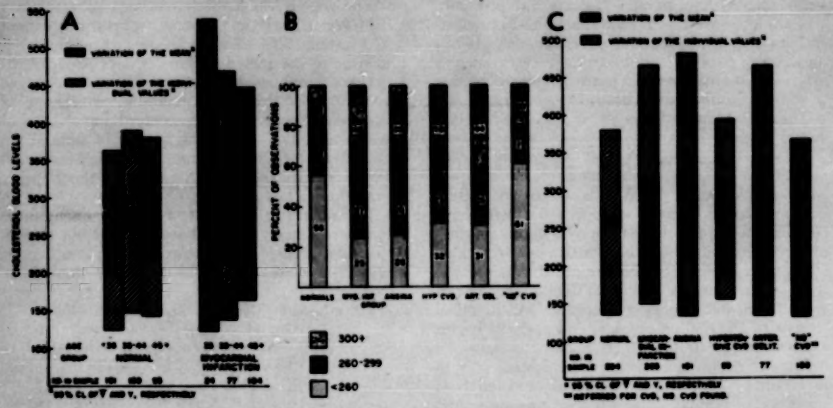

Fig. 1.—Graphic presentation of cholesterol values. *A*, variation of mean and individual values for normal and various patient groups. *B*, percentage of values occurring within various arbitrary levels. *C*, values for mean and individual variations for different age groups in both normal and myocardial infarction groups.

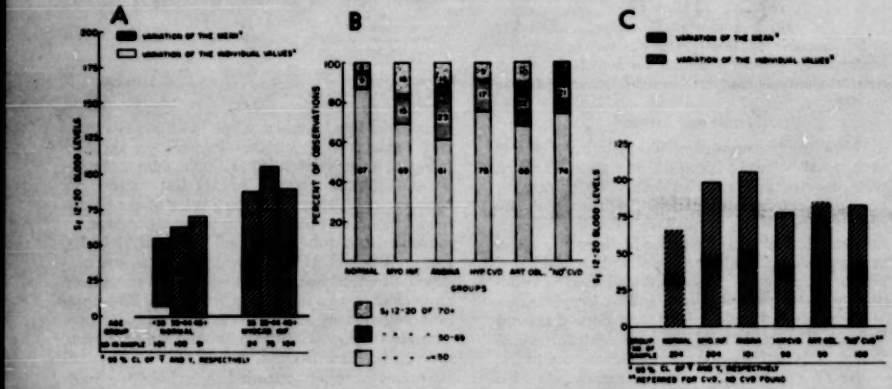

Fig. 2.—Graphic presentation of (S_f 12-20) lipoprotein values. *A*, variation of mean and individual values for normal and various patient groups. *B*, percentage of values occurring within various arbitrary levels. *C*, values for mean and individual variations for different age groups in both normal and myocardial infarction groups.

are shown in figures 1A, 2A, and 3A. The mean cholesterol value for the normals aged 35 to 44 was significantly higher than the mean value for those aged 25 to 34, but the value for those aged 45 to

The mean cholesterol values of the patients having infarctions, angina, obliterans, and hypertension were significantly higher than those of the normal group. The mean cholesterol values of the patient

group observed for cardiovascular disease, but in whom no vascular disease was found, were essentially the same as those values for the normals (fig. 1A). The mean S_f 12-20 lipoprotein values of the infarction, angina, arteriosclerosis obliterans, hypertensive, and observation groups were all significantly higher than those of the normal group (fig. 2A). The mean S_f 20-100 values for the myocardial infarction and angina groups were significantly higher than the normal groups, but those for the arteriosclerosis obliterans, hypertensive, and the observed patient groups were essentially unchanged (fig. 3A).

In comparing the three values as a measure for distinguishing the groups of patients with definite vascular disease, such as proved myocardial infarction and arteriosclerosis obliterans, from the normal group, determination of the serum cholesterol and the lipoprotein S_f 12-20 values was superior to that of the lipoprotein S_f 20-100 values.

These comparisons were also helpful in distinguishing the angina group from the normal group. The difference between the cholesterol values and the S_f 12-20 values was less striking in distinguishing the hypertensive from the normal group. The significance of the higher S_f 12-20 lipoprotein values in the observation group as compared to the normal group can only be determined by a period of observation of subsequent clinical events in this group.

From a review of the distribution of the values, it is apparent that a marked individual variation exists in the values for each of the parameters in the diseased groups as well as in the normal and the observed patient groups. There is certainly no parameter which allows a separation of the definitely diseased group from the normal on the basis of individual values (fig. 1, 2, and 3).

Predictive Values

The correlation of these initial lipid values, plus those obtained from repeated determinations at intervals, with the development of subsequent clinical events in both normal and diseased groups should give some information as to the value of lipid level determinations in predicting atherosclerosis. The total serum cholesterol values only are being repeated in the normal group during the year 1958. Similar follow-up studies by others have shown that, while a large variability occurs in a person who has repeated determinations made over a period of years, there is a tendency for those who

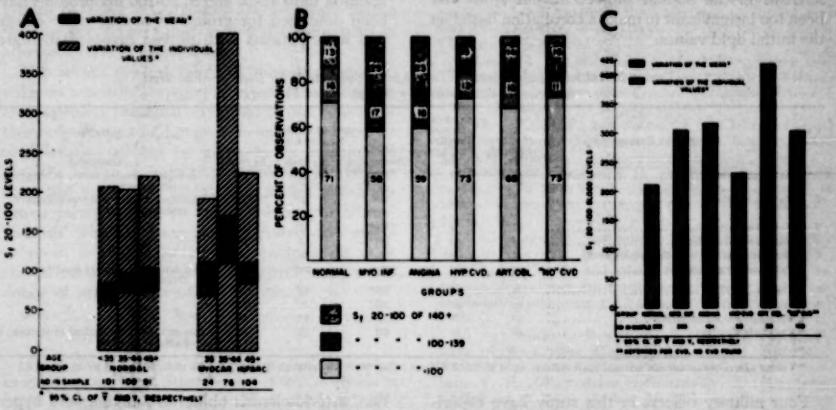

Fig. 3.—Graphic presentation of (S_f 20-100) lipoprotein values. *A*, variation of mean and individual values for normal and various patient groups. *B*, percentage of values occurring within various arbitrary levels. *C*, values for mean and individual variations for different age groups in both normal and myocardial infarction groups.

Milch and associates [13a] also noted a tendency toward stability with age. In a follow-up study of the cholesterol values of West Point cadets, beginning with the first-year men in 1952, they found that only 36.7% of those in the top 10% in 1952 remained in the top 10% in 1954, but 60.5% of those in the top 10% in 1954 remained in the top 10% in 1956. A somewhat similar finding was seen in a smaller repeat series by Thomas and co-workers.[13b] This observed tendency to stabilize with age suggest that the accumulated data from repeated determ nations made periodically over a number of yea such as during annual physical examinations, mi are found initially to have the highest level in the group to remain so and to retain this position in subsequent determinations.[13]

be more predictive of atherosclerosis or more reliable in identifying impending coronary disease than isolated determinations.

It has also been observed that the difference in the serum cholesterol levels in both well and diseased males diminishes in the older age groups and an elevated level is most significant when it is observed in men under 40 years of age.[1a] This suggests that it would be practical to make periodic lipid level determinations in males before the age of 40, which represents the age when clinical coronary disease is usually not recognized. Identifying the susceptible person in this preclinical state would provide an opportunity for preventive treatment if therapeutic or prophylactic measures prove effective in the future. The identification, to date, of recognizable vascular disease attributable to atherosclerosis in the normal subjects in our study has been too insignificant to make a correlation based on the initial lipid values.

None of the nine officers in whom recognizable vascular disease developed had initial cholesterol values under 250 mg. per 100 cc. In this small group, the serum cholesterol values presented the greatest variation from the mean, and, therefore, this would appear to have been the most accurate measure in identifying these nine subjects as having potential atherosclerosis.

Future long-term follow-up studies of the remaining normal persons as well as those patients in the angina, hypertensive, and observation groups may furnish more significant evidence for or against the value of one or more of these lipid determinations in the identification of a susceptibility to the development of atherosclerosis.

Summary

The values for serum cholesterol and S_f (Svedberg flotation unit) 12-20 and S_f 20-100 lipoproteins have been described for groups of normal male officers and male patients with proved myocardial infarc-

TABLE 2.—*Initial Lipid Values of Ten Normal Subjects Who Died or Who Had Subsequent Cardiovascular Symptoms or Findings*

Case No.	Subsequent Events	Age at Start of Study, Yr.	Interval Before Positive Findings, Mo.	Initial Values, Mg./100 Cc. Cholesterol	S_f 12-20	S_f 20-100	Comment
1	Fatal occlusion	49	7	411*	25	40	Autopsy revealed severe coronary arteriosclerosis
2	Fatal occlusion	41	16	258 267*	48*	137*	Autopsy revealed severe coronary arteriosclerosis
3	Nonfatal infarction	41	24	310*	47*	112*	
4	Nonfatal infarction	41	24	291*	16	34	
5	Hip claudication; calcification of aorta	41	8	429*	28	78	
6	Fatal cerebral accident	44	28	250	38*	144*	No autopsy; clinical cerebral arteriosclerosis
7	Angina	44	48	322*	45*	118*	
8	Angina	35	19	265*	49*	108*	
9	Vascular lesions in retina	50	24	250	18	58	
10	Fatal air accident	49	15	221	23	56	No autopsy; no clinical symptoms of vascular disease

* Values above mean for 294 normal male officers aged 25 to 50. (Mean values were cholesterol, 238.4 mg.%; S_f 12-20, 22.2; and S_f 20-100, 81.6.)

Four military officers in this study have experienced coronary occlusions, two fatal and two nonfatal. In two others, clinical symptoms considered to be angina developed. One additional patient died of cerebral vascular disease probably due to complications of cerebral arteriosclerosis. Another has been found to have extensive calcification in the abdominal aorta; in one other patient, vascular changes in the retina developed. One officer on active duty who had shown no clinical evidence of vascular disease died in an aircraft accident. In the two officers in whom fatal occlusions developed, autopsy studies showed extensive, severe coronary atherosclerosis.

The important data on these 10 persons are given in table 2, in which their lipid values are compared with the mean values for the normal subjects. It is noted that only 4 of the 10 officers had values above the mean in all three determinations and three additional officers had cholesterol values well above the mean but their lipoprotein values were below the mean.

tion, arteriosclerosis obliterans, angina, and hypertensive cardiovascular disease and observed for heart disease but with no diagnosis given. A significant increase occurred in the mean cholesterol values in the normal subjects aged 35 to 44 as compared to those aged 25 to 34, but no significant increase was seen in those aged 45 to 59 years. No significant changes were found in the lipoprotein values by age groups.

The patient groups with myocardial infarction and angina had significantly higher cholesterol and lipoprotein values (S_f 12-20 and S_f 20-100) than the normal group and those observed for heart disease. This finding supports indirectly the theoretical consideration that atherosclerosis may be associated in some manner with a disorder of lipid metabolism. The group with arteriosclerosis obliterans presented a significant increase in cholesterol and S_f 12-20 lipoprotein values but not in S_f 20-100 lipoprotein values. The hypertensive cardiovascular disease group without clinical features of coronary disease presented significant increases in cholesterol and S_f 12-20 lipoprotein values as compared with the

normal subjects, but the increases were not as great as among those with definite clinical coronary disease. The individual variations in each group were great and the differences between the values of the normal and the diseased persons were small, thus preventing efficient application of the clinical theory of identification and prediction of atherosclerosis.

In this study, the elevation of the serum cholesterol level was greater and more distinctive in the group with proved atherosclerosis than were the S_f 12-20 and S_f 20-100 values for lipoproteins. Preliminary follow-up findings in the normal group indicate a better predictive value of cholesterol determinations as indicated by the subsequent development or recognition of atherosclerotic processes in those previously regarded as normal. Periodic repeated evaluation and long-term clinical follow-up studies of this normal group and similar groups by other investigators are necessary before the true predictive value of lipid determinations in atherosclerosis is established.

The serum cholesterol level measurement provides as much information as other more elaborate and expensive chemical and physical procedures for the measurement of lipoprotein levels, and serious consideration should be given to its addition to periodic health examinations to aid in identifying disturbances in lipid metabolism which may indicate a predisposition to or the presence of atherosclerosis. The presence of an elevated cholesterol value in an otherwise normal young adult male should encourage a search to uncover further evidence of premature vascular disease.

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APPENDICITIS AND DIABETES.—When acidosis begins to be severe the diabetic patient develops pain and tenderness in the abdomen which closely simulates peritonitis secondary to appendicitis. To operate upon a patient for appendicitis, only to find that one is dealing with diabetic acidosis, is a very unfortunate error and may be disastrous. An awareness of the symptoms and findings of diabetic acidosis together with a few simple laboratory tests will usually make a proper diagnosis possible. One should bear in mind, however, that a diabetic patient in acidosis can develop appendicitis, and making the differential diagnosis in this case may be a real challenge to the surgeon. In both disease processes abdominal pain, nausea, vomiting, abdominal tenderness, elevated temperature and leukocytosis may occur. Usually the symptom of pain occurs first in appendicitis and the symptom of vomiting occurs first in diabetic acidosis. Another helpful differential point is that in appendicitis the physical signs may be more localized, and in diabetic acidosis they may be more generalized throughout the abdomen. Localized rigidity is unlikely in diabetic acidosis.—D. H. Wagner, M.D., The Preparation and Care of Diabetic Patients Requiring Surgery, *Surgical Clinics of North America*, February, 1959.

SPECIAL ARTICLES

The following two papers report studies done at the request of the Committee on Amphetamine Drugs and Athletes of the Board of Trustees of the American Medical Association. These studies represent a part of the Committee's efforts to help determine the effects of such drugs on athletic performance and the extent, if any, of their use in sports. Other findings and the recommendations of the Committee have been submitted to the Board of Trustees and will subsequently be reported to the profession and to the public.

AMPHETAMINE SULFATE AND ATHLETIC PERFORMANCE

I. OBJECTIVE EFFECTS

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and
Henry K. Beecher, M.D., Boston

The study presented here was designed to answer the question of whether or not amphetamine sulfate ("pep pills") improves athletic performance in trained athletes.

Preliminary Considerations

Controlling Factors in Planning.—We knew at the outset that many variables might influence the effect of amphetamine on athletic performance: dose level; time after medication at which event was performed; whether the subject was rested, slightly fatigued, or severely fatigued; type of athletic event performed (brief intense effort versus prolonged, less intense effort, or event where performance is largely dependent on form versus event where performance is largely dependent on strength); whether the subject performed the event competing with the clock or competing with another athlete; whether the athlete knew he was receiving a drug (and his expectations concerning its effect); whether or not the subject was in top form; mood; and motivation.

An initial exploratory phase of the investigation yielded data which did not demonstrate conclusively that amphetamine either did or did not help athletic performance, on the average. However, both the measured performance data and the subjective data obtained by interviewing the athletes indicated that at least some athletes could obtain consistent and repeatable improvements in performance by taking amphetamine sulfate in the dose of 14 mg. per 70 kg. of body weight two to three hours before a race.

This suggestion of an improved performance encouraged us to undertake the second, and much more extensive, phase of the investigation. The present report will deal primarily with the second phase. Six separate experiments comprised this phase of the investigation. Almost 800 measured performances of swimmers, runners, and weight throwers were obtained. Since each experiment was different from the others in important characteristics, each will be described separately and the results reported separately.

Subjects.—In the first and last experiments swimmers were used as subjects. In the second, third, and fourth runners were used. In the fifth weight throwers and shot putters were used. Except for the subjects in experiment four, all were members of the varsity or freshman teams of large Eastern colleges and universities. All college athletes were tested either during or immediately after their athletic season and so were in competitive physical condition. No experimental trials were run on days when the athletes were competing with athletes from other colleges.

Medicaments.—All subjects in all six experiments received, orally, both a placebo and 14 mg. of amphetamine per 70 kg. of body weight, administered on the double-blind basis. The other necessary controls [1] were also used. As will be shown below, the subjects in five of the experiments received one or more other medicaments (50 and 100 mg. of secobarbital and 7 and 21 mg. of amphetamine) in addition to a placebo and 14 mg. of amphetamine per 70 kg. of body weight. On the first day of the first experiment the medicaments were given in elixir form. Some of the subjects objected to the taste of the elixir. Therefore on the remaining 11 days of that experiment and in all subsequent experiments the medicaments were taken in capsule form. The weight of each capsule was accurate to 0.5 mg. In all experiments except the third, the

From the Anaesthesia Laboratory of the Harvard Medical School at the Massachusetts General Hospital.

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subjects were given an envelope containing the medicament a day or two before each experimental session. The time at which each capsule was to be taken was written on the envelope containing the capsule. On arriving for the experimental session the subject was asked to inform the experimenter if he had taken the medicament as much as five minutes early or late. In all studies the subjects began their experimental session from two to three hours after taking amphetamine. The time interval was shorter (15, 55, and 60 minutes) for those who took secobarbital. These and other details concerning each of the six experiments are presented below. In describing the various experiments an explanation will be given as to why the experiments were carried out as they were.

Each day before taking the medicament the subject completed a questionnaire giving information about the following items: last night's rest, today's energy level, physical impairments, and degree of eagerness for today's workout. Each day the subject completed an 81-item adjective check list describing his mood and physical condition. The check list was completed once before taking medicament and twice afterward. In addition, after his performance, each subject completed a questionnaire designed to help him evaluate his performance. The results obtained with the questionnaires and check lists will be presented in two subsequent papers.

Method

Experiment 1.—Fifteen collegiate swimmers served as subjects in the first experiment. Each man swam his event twice on each of 12 consecutive experimental days. The second swim began 15 minutes after the beginning of the first and therefore was performed under conditions of fatigue. Three men swam the 100-yd. butterfly, three the 100-yd. free style, three the 200-yd. free style, three the 200-yd. breast stroke, and three the 200-yd. back stroke.

On 4 of the 12 days a subject received 14 mg. of amphetamine per 70 kg. of body weight. On four he received placebo, and on four he received 100 mg. of secobarbital per 70 kg. of body weight. The exploratory phase of our investigation had indicated that a few subjects were able consistently to distinguish the effect of 7 mg. of amphetamine per 70 kg. of body weight from those of a placebo. Since the subjects knew the investigation was one dealing with "pep pills," the possibility existed that a "suggestion effect" was produced whenever the subject noticed any unusual feelings or sensations. In other words, it was possible for the performance to be better on "amphetamine days" than on "placebo days" not because the "pep pills" invigorated the athlete or heightened his motivation but simply because he noticed unusual feelings and sensations and assumed this meant he had been given the "pep pill," expected help from it, and so performed better than usual. The reason for using secobarbital with amphetamine and placebo in five of the six experiments of the second phase of the investigation was to prevent the subject from correctly assuming he had received amphetamine whenever he noticed any unusual feelings or sensations. It was also used in an attempt to clarify the question of whether an amphetamine improvement, when it occurs, is due largely to changes in attitude and psychic state. The added advantage of the two drugs chosen is that earlier work [8] had indicated that both have euphoric power while one is a so-called stimulant and the other a depressant. (The subjects were told only that "pep pills" and placebos were being used.)

The design of this experiment required that each subject receive amphetamine on four days, placebo on four, and secobarbital on four. An attempt was made to control for order-effects which could be produced by progressive changes in level of performance, progressive changes in attitude toward the experiment, and other factors. To control for such effects, the drug sequence was set up so that any given subject would receive one dose of amphetamine, one of placebo, and one of secobarbital during each of the four quarters of his 12 trials. There are six possible ways of ordering three drugs: 123, 132, 231, 213, 312, 321. Each subject was assigned four such sequences, each involving three drugs, giving a total of 12 medicaments. The experimenter collecting the data did not know which drug any particular subject had on any given day. This same general procedure was followed to control for order-effects in the remaining studies.

The 12 experimental days were grouped into 6 competitive days (where the three men in a group raced against each other) and 6 individual days (where each man swam alone, racing against the clock). There were two competitive days and two individual days for each of the three types of medication—amphetamine, secobarbital, and placebo. On one of the individual amphetamine days and on one of the competitive amphetamine days the subject took amphetamine two hours before the beginning of the first swim. On the two remaining amphetamine days he took the medicament three hours before beginning the first swim.

Preliminary studies led us to believe the peak subjective and behavioral effects of 14 mg. of amphetamine occurred between two and three hours after medication, whereas that for 100 mg. of secobarbital was approximately one hour. Consequently the experiment was designed so that the interval between the taking of the active medicament and the beginning of the first swim would be two hours for half of the amphetamine sessions, three hours for the other half, and 55 minutes for all the secobarbital sessions.

On all days a subject took two capsules. The first was taken at either two hours or three hours before the first swim. (Twice under each of the three drugs it was two hours; twice under each it was three.) The second capsule was taken 55 minutes before the first swim on all 12 occasions. On amphetamine days the first capsule contained the amphetamine and the second was a placebo. On placebo days both were placebos. On secobarbital days the first capsule was a placebo and the second contained secobarbital. On placebo days and on secobarbital days the first capsule (which was always a placebo) was taken two hours before the first swim on half of the occasions and three hours before it on the other half.

Each experimental day was organized around six events which were strictly timed. 1. At a specified time (either two or three hours before the first swim) the subject took his first capsule. 2. Fifty-five minutes before the first swim he took his second capsule. 3. Twenty-five minutes before his first swim the subject reported to one of the experimenters and told him if he had failed to take either of the two capsules within five minutes of the time specified. (In no instance did the interval between reported medication time and beginning of first swim deviate from the scheduled interval by more than 15 minutes. The decision was made, without knowledge of drug orderer, not to discard the data which were slightly—5 to 15 minutes—off schedule.) 4. Fifteen minutes later the subject began his warm-up swim, which was timed by a second experimenter to last three to five minutes. 5. The swimmer rested approximately five minutes after warming up and began his first swim exactly 10 minutes after the beginning of the warm-up. 6. Fifteen minutes (plus or minus one minute) after the beginning of his first swim the subject began his second swim.

Each swimmer was timed by two or more clocks. Always one was an ordinary stop watch and one was a 0.01-second electric clock which started automatically at the sound of the gun. (The electric timing device is an invention of Mr. David Collander of Massachusetts Institute of Technology.) One or more additional stop watches were used on approximately half of the races.

Because the electric timing device eliminated the reaction time of starting the stop watch, the electric times were longer (an average of 0.18 second) than the manual times. In coordinating the manual and electric data this difference was taken into account. All time information for each race was examined (without knowledge of which medicament had been given) and the median was accepted as accurate. This same procedure was used in experiment 6. In experiments 2, 3, and 4 only one clock (a manual stop watch) was used for each runner.

The subjects were scheduled in staggered fashion, the first reporting at 4 p. m. and the last reporting at 5:30 p. m. There were a few deviations from this plan due to scheduling problems. However no subject ever reported earlier than 3 or later than 6 p. m.

The cooperation on the part of the subjects in this experiment was exceptionally good. They usually reported for the experiment about five minutes before they were scheduled to arrive. In the total 180 sessions no more than five began late, and in these instances the lateness was usually between 5 and 15 minutes.

Experiment 2.—Nine collegiate track men served as subjects in experiment 2. Three ran 600 yd., three ran 1,000 yd., and three ran one mile. Each man ran these distances only once each experimental day. The sessions were separated by at least one day. Experimental sessions were never carried out either on the day of a meet with another school or on the day preceding such a meet. The runs occurred on an indoor track with a cinder surface. The men ran in competitive groups of three, except on two occasions when scheduling problems reduced the size of a group to two. All races occurred between 4:30 and 5:15 p. m.

The experimental design called for nine runs from each subject, three sessions in which the subject would be medicated with 14 mg. of amphetamine per 70 kg. of body weight, three with 50 mg. of secobarbital per 70 kg., and three with placebo. Due to illness one subject completed only three runs and so contributed only one run under each of the three medication conditions. Following the procedure outlined in experiment 1, the secobarbital was taken one hour before running and the amphetamine was taken two hours before running.

In this experiment and in the subsequent ones the barbiturate dosage was only half that used in experiment 1. As mentioned above, the barbiturate was used to prevent the subject from correctly assuming he had received amphetamine whenever he thought he perceived drug-effects. The 100-mg. dosage, used in experiment 1, was so potent that subjects occasionally said such things as the following to the experimenter: "I feel sort of dopey. I think I got a sleeping pill today." To reduce the obviousness of its effects, the secobarbital dosage was changed to 50 mg. per 70 kg. in the present experiment and in the three subsequent ones where secobarbital was used.

Analysis of the data of experiment 2 was complicated by the fact that on the day of session 8 the track was filled with holes. Session 8 occurred after the track season was over and the baseball players had begun practicing in the indoor track "cage." Due to an oversight the track had not been rolled before the beginning of this session, and baseball practice had left it in bad condition. The amount of impairment produced by the poor track

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conditions was assessed by obtaining for each subject the difference between his time on session 8 and his mean time on the other two sessions when he ran under the same type of medication as that given him on session 8. In all instances the time for session 8 was greater. The average difference for the group was 12.6 seconds. The average percent difference was 6.7. The "t" value for the mean difference of 6.7 was 3.41, which is beyond the 0.02 level of significance. The results of experiment 2 are reported both including and excluding the data obtained on session 8.

Experiment 3.—In experiment 3 eight collegiate track men ran once on each of six experimental days. They ran in competitive groups of two or three on an outdoor wooden track. Three men ran a mile. Three ran 600 yd. Two ran 440 yd. The subjects were given 14 mg. of amphetamine per 70 kg. on two occasions, with 50 mg. of secobarbital per 70 kg. on two and with placebo on two. Each day the subject took two casules. The first capsule was taken two hours and the second one hour before running. On amphetamine days the first capsule contained amphetamine and the second was a placebo. On the secobarbital days the second capsule contained the active agent. Both capsules were inactive on the placebo days. All runs took place between 2 and 4:30 p.m.

The original design of this experiment called for 12 runs from each subject. However only six were completed by the time the wooden track was removed for spring baseball practice. Our aim had been to have an interval of at least one day between experimental sessions. However in about one-third of the cases this was not possible because of scheduling problems. The cooperation of these subjects was poorer than that of the other groups studied. Their races were frequently 10 to 20 minutes off schedule. There were numerous cancellations and changes of schedule. Interpretation of the results was further complicated by the fact that the subjects ran on an outdoor track during winter. The temperature and wind velocity varied considerably and influenced running times.

Experiment 4.—The nine subjects participating in experiment 4 were marathon runners preparing for the Boston Athletic Association Marathon and other long-distance races. They were tested during the two months preceding the marathon, which occurred on April 20.

These subjects were different from those in the other five experiments primarily by virtue of age. The age range was 22 to 41 years, with a median of 33 years. Four of these men had attended college. All of them were experienced runners. Most had been running for several years. Seven had won Amateur Athletic Union–sponsored long-distance races on one or more occasions. The other two had been among the first five to finish in one or more such races.

The original design called for 12 runs from each man, three times after the placebo had been given, three times with 50 mg. of secobarbital per 70 kg., twice with 7 mg. of amphetamine per 70 kg., and twice with 14 mg. and twice with 21 mg. amphetamine per 70 kg. Because of weather difficulties and injuries only three of the runners completed all 12 runs. Two completed 8, one 10, one 9, one 6, and one 5 runs.

Any given subject in this experiment ran the same distance and the same course each day. However, the various subjects ran different courses. The shortest course was approximately 4.5 miles and the longest approximately 12.7 miles. Each subject timed himself.

Each day a subject took two capsules. He took the first capsule two hours and the second 15 minutes before beginning the race. As in the preceding experiments amphetamine medicaments were put in the first capsule, secobarbital in the second, and placebos in both. The various subjects ran for different lengths of time, depending on the length of their course and their running speed. The shortest running time occurred on a 4.7-mile course (24 minutes and 10.5 seconds) and the longest running time occurred on the 12.7-mile course (92 minutes and 20 seconds). The time interval between taking the second capsule and starting the race was shorter (15 minutes) in this experiment than in the others. This was done primarily for reasons of safety. (Several of the subjects drove automobiles to the starting point of their courses. We did not want subjects who were unprepared for the possible effects of mental clouding and sedation to begin experiencing these effects while driving to their courses.)

Before beginning the experiment a subject was told the reason for the study and was told that extraneous factors such as weather conditions and his physical condition could influence the results of his time-trials. He was asked to control as well as possible all such factors and, in particular, not to take the medicament when the weather was bad. The subject filled in a questionnaire after each race, indicating all factors which might have influenced his running time that day.

In all experiments we pointed out to the subject that his role was that of experimenter as well as subject. An attempt was made to inspire all subjects to be meticulously careful and honest in carrying out their responsibilities. An especially strong effort was made in this respect in the present experiment because all measured performances of the marathon runners were carried out in the absence of the experimenter. The subject was given 12 packages, each containing the medicament and performance-analysis materials for one trial. He was asked to run the same course every session, not to run when the weather was bad, and not to run when his physical condition was impaired to an extent which might affect his running time. In the entire 82

runs of this experiment only 3 were discarded because of violation of these controls. One session was discarded because subject 4 altered his course on that day. (Snow began to fall after the subject had begun his run. In an attempt to compensate for this, he shortened his course.) On another occasion subject 5 (whose 6.8-mile course was an approximately straight line between his home and his place of work) discovered on beginning his race that he had to face a 30-mile per hour headwind the entire distance. On this occasion his time was 49.30 (49 minutes and 30 seconds). In his remaining 11 trials there was a 2.75-minute range (from 40:30 to 43:15). The wind caused his time to fall 6.25 minutes outside that range. On the third discarded occasion a still different runner (subject 7) ran an experimental session the day after he had competed in a 30-km. (18.64-mile) Amateur Athletic Union race. He began the race reporting sore feet as a

Both weight-throwers and shot-putters threw 15 to 25 times each day. (The subjects were told that their first three throws would be considered warm-up throws and would not be counted. In analyzing the data the decision was made to eliminate the first five rather than the first three because the fourth and fifth throws were in general below the mean of the remaining throws. This decision was made without knowledge of the drug administered to a given subject on a given day.) Chalk lines were drawn every 5 ft. within the throwing range. An experimenter was stationed about 30 ft. from the point at which the weight was expected to fall. When it landed, the experimenter estimated its distance by relating the identation made in the ground at the point of contact to the system of chalk lines. (Time limitations prevented tape measurement.) After each throw the subject walked to the point where his throw had landed and then

TABLE 1.—*Comparative Effects, in Experiment 1, of Amphetamine Sulfate, Secobarbital, and Placebo on Performance Times of Fifteen Subjects Swimming Under Rested and Fatigued Conditions**

Swimming Style	Subject No.	First Swim, Rested Condition† Time, Sec. P	A	S	P-A	P-A, %	P-S	P-S, %	Second Swim, Fatigued Condition† Time, Sec. P	A	S	P-A	P-A, %	P-S	P-S, %
Free style, 100-yd.	1.....	57.46	56.92	57.94	+0.54	+0.94	−0.48	−0.84	58.77	58.66	60.67	+0.11	+ .19	−1.90	−3.21
	2.....	58.50	57.89	60.07	+0.67	+1.14	−1.51	−2.58	60.01	58.97	60.90	+1.04	+1.73	−0.89	−1.48
	3.....	56.38	55.81	56.91	+0.57	+1.01	−0.53	−0.94	59.14	57.95	58.10	+1.19	+2.01	+1.04	+1.76
Butterfly, 100-yd.	4.....	65.49	64.44	69.50	+1.05	+1.60	−4.01	−6.12	66.53	65.01	70.56	+1.52	+2.28	−4.03	−6.06
	5.....	69.87	69.82	71.35	+0.05	+0.07	−1.48	−2.12	72.33	71.24	74.34	+1.09	+1.51	−2.01	−2.78
	6.....	77.52	73.82	76.18	+3.70	+4.77	+1.34	+1.73	89.32	88.16	91.61	+1.16	+1.30	−2.29	−2.56
Free style, 200-yd.	7.....	136.77	136.74	143.13	+0.03	+0.02	−6.36	−4.65	143.84	145.86	148.83	−2.02	−1.40	−4.99	−3.47
	8.....	139.02	139.76	144.81	+0.86	+0.62	−5.19	−3.72	146.22	143.51	147.28	+2.71	+1.85	−1.06	−0.72
	9.....	134.25	132.31	136.47	+1.94	+1.45	−2.22	−1.65	142.67	137.76	144.59	+4.91	+3.44	−1.92	−1.35
Back stroke, 200-yd.	10.....	148.52	145.59	152.73	+2.93	+1.97	−4.21	−2.83	152.78	150.89	153.60	+1.89	+1.24	−0.82	−0.54
	11.....	164.24	162.52	166.48	+1.72	+1.05	−2.24	−1.36	169.61	170.59	171.68	−0.98	−0.58	−2.07	−1.22
	12.....	166.65	166.85	169.06	−0.20	−0.12	−2.41	−1.45	177.65	180.68	176.11	−3.03	−1.71	+0.94	+0.53
Breast stroke, 200-yd.	13.....	160.84	159.39	161.62	+1.45	+0.90	−0.78	−0.48	162.65	165.52	164.15	−3.47	−2.14	−2.10	−1.30
	14.....	176.95	174.10	177.07	+2.85	+1.61	−0.12	−0.07	179.87	179.38	180.45	+0.49	+0.27	−0.58	−0.32
	15.....	177.82	177.16	180.28	+0.66	+0.37	−2.46	−1.38	183.51	185.72	184.60	−2.21	−1.20	−1.09	−0.59

* Dosages were 14 mg. of amphetamine sulfate per 70 kg. of body weight and 100 mg. of secobarbital per 70 kg. of body weight.

† P= mean placebo time for each subject. A=mean amphetamine time for each subject. S=mean secobarbital time for each subject. $\frac{P\text{-}A}{P}$, % indicates change in performance under amphetamine; + indicates improvement; − indicates impairment. The per cent change scores listed under $\frac{P\text{-}A}{P}$, % were obtained with the formula $\left(\frac{P\text{-}A}{P}\right)$ (100).

physical impairment. He ran his 4.7-mile course that day in 33 minutes and 52 seconds. As in the case of the man running against the headwind, the time just reported was grossly out of line with the remaining ones. On this man's remaining eight trials his best time was 24:10.5 and his worst was 27:15 (a range of 3 minutes and 4.5 seconds). His "sore feet" time of 33:52 was over six minutes outside the range of his other eight races.

Experiment 5.—Thirteen collegiate weight-throwers and shot-putters served as subjects in experiment 5. Nine threw the 35-lb. weight. Four put the 16-lb. shot. All were members of varsity or freshmen teams. (Although shot-putters are sometimes called weight-throwers, the present report will distinguish between the two groups by calling the nine who threw the 35-lb. weight weight-throwers and calling the four who put the 15-lb. shot shot-putters.) All experimental sessions were carried out in a heated indoor track cage.

gave his own distance-estimate to the experimenter. In general the discrepancies between estimates made by the experimenter and those made by subjects were less than one foot. The average for all subjects for all sessions was 0.41 ft.

The design called for 12 sessions, four with 14 mg. of amphetamine per 70 kg. of body weight, four with 50 mg. secobarbital per 70 kg., and four with placebo. Only 7 of the 13 men completed all 12 sessions. Two were there for 10, one for 6, one for 5, and two for 4 sessions. The two subjects contributing only four sessions (subjects 7 and 8) (tables 8 and 9) were 35-lb. weight-throwers who were somewhat uninterested in the experiment. In general their cooperation was poor. Five of their eight sessions were ones on which they either reported late or failed to take their medicament on time. The subject contributing five sessions (subject 9) was a freshman who changed his style after the third session, adding another body turn. The data

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contributed by the three men just mentioned are suspect as well as sparse. Consequently the weight-throwing analyses have been done both including and excluding these three subjects. As in the earlier experiments the subjects took two capsules each day, one or both of which contained placebos. Amphetamine was taken two hours and secobarbital one hour before the session began.

Although no subject contributed more than 12 sessions the study lasted a total of 15 days because of missed sessions and make-ups. The experimental sessions began at 4:30 p.m. on each of the first nine days of the study. Because of unavailability of space they began at 7:30 p.m. on the final six days. During the latter sessions the subjects were instructed to take their first capsule at 5:45 p.m., eat dinner at 6:15, take their second capsule at 6:45, and report for the experiment at 7:30. (The effect of amphetamine on performance was found to be somewhat similar in the afternoon (mean improvement = 4.84%) and in the evening (mean improvement = 6.29%.)

encourage the subjects to give an "all out" effort. They did not have to save themselves for a second race.

The major difference between experiments 1 and 6 was that in the sixth we tried to guarantee maximum effort from each subject on all swims. (We had asked for maximum effort in all experiments. However, in experiments 1, 2, and 3 we compared the experimental times with those achieved in meets with other schools and found the experimental times to be slower for most subjects than the meet times. Interestingly, this was not the case with the weight-throwers and shot-putters of experiment 5. The longest experimental throws were, in general, as far as the longest meet throws.) To achieve an experimental situation which would stimulate maximum effort and approximate the psychological atmosphere of a competition with another college the following steps were taken. First, the subjects were called together for a meeting before the experiment began. At this meeting it was explained that the sole purpose of the experiment was to test the pep

TABLE 2.—*Statistical Evaluations, for Experiment 1, of the Comparative Effects of Amphetamine and Placebo on Swimming Times of Fifteen Swimmers Under Rested and Fatigued Conditions*

No. of Swimmers	Distance of Swim Yd.	First Swim, Rested Condition*						Second Swim, Fatigued Condition*					
		Average Magnitude of Effect			Average Percent of Effect			Average Magnitude of Effect			Average Percent of Effect		
		$\overline{P\text{-}A}$	"t"	p	$\frac{\overline{P\text{-}A}}{\overline{P}}$, %	"t"	p	$\overline{P\text{-}A}$	"t"	p	$\frac{\overline{P\text{-}A}}{\overline{P}}$, %	"t"	p
6	100	+1.02	5.21	0.01	+1.50	5.03	0.01	+1.10	2.04	0.10	+1.59	2.38	0.10
9	200	−0.19	0.39	NS	−0.03	0.04	NS	+1.36	3.63	0.01	+0.87	3.65	0.01
15	Combined Groups	+ .29	0.50	NS	+0.59	1.36	0.20	+1.26	4.17	0.001	+1.16	3.82	0.01

* $\overline{P\text{-}A}$=mean difference for the group of $\overline{P\text{-}A}$ scores presented in table 1.
$\frac{\overline{P\text{-}A}}{\overline{P}}$, %=mean difference for the group of $\frac{P\text{-}A}{P}$, % scores presented in table 1.
t="t" test value for correlated means.
p=two-tailed probability value.
NS=not significant at or beyond the 0.20 level using a two-tailed test.

Experiment 6.—Sixteen swimmers served in this experiment. Thirteen of them had previously been subjects in experiment 1. Three were new. There were several ways in which this experiment differed from the first one. There were 6 sessions rather than 12. On three days a subject received 14 mg. of amphetamine; on three he received a placebo. No secobarbital was used. The drug order was random with the two restrictions that (1) no subject would receive the same medicament three times consecutively and (2) no subject would receive the same medicament on either the first and second or the fifth and sixth sessions. All capsules were taken two hours before the race. With a few exceptions an interval of one day intervened between adjacent experimental sessions. Experiment 1, on the other hand, had been run on consecutive days. Experiment 6 was begun two days after the final competitive meet of the year. Experiment 1 had been carried out in the early part of the season. In the present experiment each subject swam only once each day rather than twice. This was done to

pills under conditions which simulated the school competition situation. We explained that our investigation could not be considered complete until we knew whether the pep pills were effective under conditions of maximum motivation and 100% effort. (No information was given concerning the results of the previous experiments.)

Second, the race times each swimmer had achieved in the final three to five competition swims of the season were collected from the coach and the median of these times was computed for each subject. At the preexperimental meeting each subject was given his median competition time and was told that this was the goal he was to attempt to match in the experimental swims. The subjects were told that each man whose median experimental time equaled or beat his median competition time would be treated to a steak dinner, where he could order anything he wanted up to $7.50. Furthermore, they were told the whole group would win the dinner if as many as half of the men won.

Third, the swimmers were asked to cheer on their teammates just as they customarily did during competition with other schools. Throughout the experiment the swimmers did this. Indeed, several observers remarked that on some experimental sessions the enthusiasm and excitement were greater than that seen at meets with other schools.

Several of the swimmers made their "steak" times on both the first and second experimental days. This raised the possibility that certain of the subjects might win their steaks on the first four swims and then relax on the last two. To avoid this a new element was added to the experiment at the beginning of the third day. The subjects were told that any swimmer who made his "steak" time on five out of six occasions would be treated to an extra steak dinner on some evening subsequent to the first.

Fifteen of the 16 swimmers completed their six scheduled swims. One (subject 13) became ill and was able to complete only three (table 11). Another (subject 14) had a series of misfortunes. He missed four regularly scheduled sessions, which he subsequently made up. Once he caught the "flu." Once he received a third degree burn on his arm. In addition to missing four regular sessions he performed four of his swims under handicapped conditions. Once he swam still feeling weak from the "flu." Twice he swam with a bandage covering the burn on his arm and reported that the water caused pain at the point of the burn. On still another occasion he received an allergy shot before swimming and reported that this had produced swelling, stiffness, and pain in his arm. The range between his best and worst time was 11.2 seconds. This is more than five times as great as the mean range for the

TABLE 3.—*Statistical Evaluations of the Comparative Effects in Experiment 1, of Placebo and Amphetamine Sulfate on Swimming Times of Men Swimming Individually and in Competition with Each Other Under Rested and Fatigued Conditions.**

Distance of Swim, Yd.	No. of Subjects	Swimming Individually: 2 Hr. After Medication Md	"t"	p	3 Hr. After Medication Md	"t"	p	2 and 3 Hr. Combined Md	"t"	p	Swimming in Competition: 2 Hr. After Medication Md	"t"	p	3 Hr. After Medication Md	"t"	p	2 and 3 Hr. Combined Md	"t"	p
First Swim, Effect, Av. Magnitude																			
100	6	+0.76	1.51	0.20	+1.71	2.63	0.05	+1.24	2.19	0.10	+0.81	1.53	0.20	+1.10	1.62	0.20	+0.96	1.65	0.20
200	9	+2.41	3.28	0.02	+1.49	1.78	0.20	+1.95	2.63	0.05	+0.88	1.36	NS	+0.65	0.68	NS	+0.77	1.21	NS
100 and 200	15	+1.75	3.38	0.01	+1.57	2.87	0.02	+1.67	3.38	0.01	+0.86	1.87	0.10	+0.83	1.35	0.20	+0.84	1.95	0.10
First Swim, Effect, Av. %																			
100	6	+1.06	1.48	0.20	+2.55	3.12	0.05	+1.81	2.46	0.10	+1.39	1.69	0.20	+1.53	1.73	0.20	+1.37	1.84	0.20
200	9	+1.48	3.59	0.01	+0.89	1.66	0.20	+1.19	2.63	0.05	+0.61	1.39	NS	+0.43	0.65	NS	+0.54	1.25	NS
100 and 200	15	+1.32	3.54	0.01	+1.56	3.18	0.01	+1.44	3.66	0.01	+0.86	2.23	0.05	+0.87	1.63	0.20	+0.87	2.20	0.05
Second Swim, Effect, Av. Magnitude																			
100	6	+1.23	2.45	0.10	+1.52	6.85	0.001	+1.38	4.53	0.01	−0.02	0.05	NS	+1.34	2.99	0.05	+0.66	4.61	0.02
200	9	+1.01	0.61	NS	+2.57	2.01	0.10	+1.79	1.27	NS	−1.11	1.59	0.20	−3.22	3.16	0.20	−2.17	3.23	0.02
100 and 200	15	+1.10	1.10	NS	+2.15	2.81	0.02	+1.62	1.94	0.10	−0.68	1.45	0.20	−1.40	1.62	0.20	−1.04	1.91	0.10
Second Swim, Effect, Av. %																			
100	6	+1.74	2.43	0.10	+2.27	6.24	0.01	+2.01	4.59	0.01	+0.12	0.22	NS	+1.88	2.97	0.05	+1.01	3.71	0.02
200	9	+0.75	0.69	NS	+1.72	2.01	0.10	+1.20	1.27	NS	−0.66	1.41	0.20	−1.96	3.07	0.02	−1.31	3.16	0.02
100 and 200	15	+1.14	1.62	0.20	+1.94	3.69	0.01	+1.52	2.60	0.05	−0.35	0.88	NS	−0.42	0.63	NS	−0.39	0.96	NS

* The 72 Md values (mean difference values) give a more detailed breakdown of information presented in table 2. Average magnitude and average per cent differences between amphetamine time and placebo time for the three groups (100-yd., 200-yd., and combined) are presented separately for individual and competition conditions. Within each of those conditions there is a further breakdown for the 2-hr. and 3-hr. intervals. For the most detailed breakdown, each Md score is based on only one amphetamine and one placebo time for each subject.

In general, the attempt to obtain maximum performance was successful. Nine of the 16 swimmers broke their "steak" times on at least three out of six occasions. Two broke their lifetime records. Five more came within 0.3 second of their lifetime records. Forty-seven of the 93 swims reached the "steak" time criterion. One might wonder why the "steak" time incentive was so effective with these subjects. This incentive was chosen because we discovered in talking with the subjects after the first experiment that winning a steak dinner appeared to have symbolic significance for the boys. On various past occasions certain ones of them had been given steak dinner incentives by their coaches. In these instances the steak dinner had meant much more than its monetary equivalent. Our experimental "steak" time arrangement was selected in an effort to tap this previously established symbolic reward system.

remaining 15 subjects. The swimming analyses reported in the next section were performed both including and excluding these two swimmers.

Four of the 16 subjects swam the 200-yd. breast stroke, 3 swam the 200-yd. back stroke, 3 the 200-yd. free style, 3 the 100-yd. butterfly, and 3 the 100-yd. free style. All races occurred between 4:30 and 6:30 p.m. Eleven of the subjects swam in groups of two or three. Five swam alone. All 16 subjects were combined into a single group in the analyses because examination of the comparative swimming times under the effects of amphetamine and placebo indicated that the 5 men who swam alone were not affected differently by amphetamine than were the 11 who swam in groups. Presumably this was because the subjects swam with maximum or near maximum motivation whether swimming alone or in groups. The results of this experiment are reported in table 11.

As in experiment 1, the cooperation of subjects in this experiment was remarkable. In the entire 96 occasions, subjects reported more than five minutes late only three times. On two occasions subjects reported taking medicaments late; one subject took one of his medicaments 10 minutes late and another was 15 minutes late in taking one of his.

Data Collected in Phase 1.—Our investigation of the effects of pep pills on athletes was carried out in two phases. The first provided a broad exploratory coverage of the problem. We studied several different dose levels using various time intervals between medication and performance. One dose level (7 mg. per 70 kg.) was studied in a sufficient number of subjects (20) to warrant inclusion in this report. Those data are presented in the section on results, after presentation of the more substantial and extensive results obtained in phase 2.

The work done in the first phase was exploratory. Different subjects were studied differently. In presenting the results obtained with each subject a tabular summary of the more important methodological details will be given.

RESULTS

Experiment 1.—Experiment 1 was the most extensive and intricate of the six experiments described in the preceding section. It provided 360 measured performances by 100-yd. and 200-yd. swimmers. The results obtained with each of the 15 swimmers in the first experiment are presented in table 1. Each subject swam four times under each of three drug conditions: placebo, amphetamine (14 mg. per 70 kg. of body weight), and secobarbital (100 mg. per 70 kg.). Each subject's mean time for the first (rested condition) swim on the four placebo sessions and his corresponding mean time for amphetamine and secobarbital sessions are shown; times for the second (fatigued) swims under influence of placebo, amphetamine, and secobarbital, respectively, are also shown. (The results of the statistical analyses of the data presented in table 1 are shown in tables 2 and 4.)

Table 1 shows the difference between each subject's mean placebo time and his mean amphetamine time for the first swim. Of the 15 subjects, all but one have plus scores, indicating that they swam faster under influence of amphetamine than of placebo. The mean improvement for the 15 subjects taken as a group was 1.26 seconds. As shown in table 2, this improvement is very significant, statistically. When evaluated with the "t" test for correlated means it yields a "t" value of 4.17, which is beyond the 0.001 level of significance using a two-tailed test.

Column 5 of table 1 presents the comparative performance under influence of amphetamine and placebo on the first swim in a different way. Here the difference between a subject's mean placebo score and his mean amphetamine score is expressed as a percentage of his mean placebo score. Table 2 shows that the 15 swimmers taken as a group obtained a mean improvement of 1.16% under amphetamine. This average improvement yields a "t" of 3.82, which is beyond the 0.01 level of significance.

Column 6 of table 1 shows the comparative swimming time under influence of placebo and secobarbital. Fourteen of the 15 subjects were impaired by secobarbital. The group had an average impairment of 2.18 seconds. The corresponding percentage of impairment for the group was 1.9%. The "t" values for these mean differences are shown in table 4.

Column 11 of table 1 presents the comparative effects of amphetamine and placebo on the second swim. The performance of 10 of the 15 subjects was improved by amphetamine. However, the average

TABLE 4.—*Statistical Evaluations in Experiment 1, of Comparative Effects of Placebo and Secobarbital on Swimming Times of Men Swimming Individually and in Competition with Each Other Under Rested and Fatigued Conditions Fifty-five Minutes after Medication.**

Distance of Swim, Yd.	No. of Subjects	Swimming Individually			Swimming in Competition			Combined		
		Md	"t"	p	Md	"t"	p	Md	"t"	p
First Swim, Effect, Av. Magnitude										
100	6	−1.41	1.15	NS	−0.81	1.82	0.20	−1.11	1.55	0.20
200	9	−2.87	3.21	0.02	−2.50	4.90	0.01	−2.89	4.30	0.01
Combined	15	−2.28	3.15	0.01	−2.07	4.37	0.001	−2.18	4.10	0.01
First Swim, Effect, Av. %										
100	6	−2.30	1.36	NS	−1.32	2.06	0.10	−1.81	1.72	0.20
200	9	−1.90	3.05	0.02	−1.92	4.54	0.01	−1.85	3.92	0.01
Combined	15	−2.12	2.68	0.02	−1.68	4.72	0.001	−1.90	3.83	0.01
Second Swim, Av. Magnitude										
100	6	−2.20	2.21	0.10	−0.98	1.32	NS	−1.58	2.30	0.10
200	9	−0.97	1.11	NS	−2.07	3.71	0.01	−1.52	2.84	0.05
Combined	15	−1.46	2.22	0.05	−1.62	3.61	0.01	−1.55	3.80	0.01
Second Swim, Av. %										
100	6	−3.23	2.15	0.10	−1.22	1.17	NS	−2.22	2.17	0.10
200	9	−0.67	1.18	NS	−1.44	3.85	0.01	−1.00	2.73	0.05
Combined	15	−1.70	2.29	0.05	−1.35	2.98	0.01	−1.49	3.16	0.01

* Symbols are defined in earlier tables. The Md scores are based on the $\overline{P-S}$ and $\frac{\overline{P-S}}{\overline{P}}$, % scores presented in table 1.

improvement for the group was only 0.29 second. The corresponding average percentage improvement was 0.59% (table 2).

Column 13 shows that 13 of the 15 subjects were impaired by secobarbital on the second swim. The average impairment for the group was 1.55 seconds ("t"=3.80; $p<0.01$). The corresponding impairment was 1.49% ("t"=3.16; $p<0.01$) (table 4).

Table 1 presents the results of the statistical comparisons of placebo versus amphetamine (14 mg. per 70 kg.) for each of three groups: the six 100-yd. men, the nine 200-yd. men, and the 15 swimmers combined. The results shown in table 2 were arrived at using the "t" test for correlated means. The "t" test values and their associated two-tailed probability values are reported both for magnitude of difference (mean placebo minus mean amphetamine) and for percentage of difference (mean placebo minus mean amphetamine/mean placebo). In these comparisons there is no breakdown for the

TABLE 5.—*Comparative Effects of Amphetamine Sulfate, Secobarbital, and Placebo on Performance Times of Five Groups of Subjects Swimming Under Rested and Fatigued Conditions.**

	First Swim, Rested Condition			
	$\overline{P\text{-}A}$	$\overline{P}$, %	$\overline{P\text{-}S}$	$\overline{P}$, %
100-yd. free style swimmers (n=3)	+1.60	+2.15	−1.38	−2.17
100-yd. butterfly (n=3)	+0.59	+1.03	−0.84	−1.45
200-yd. free style (n=3)	+0.94	+0.70	−4.59	−3.34
200-yd. back stroke (n=3)	+1.65	+0.96	−1.12	−0.64
200-yd. breast stroke (n=3)	+1.49	+0.97	−2.86	−1.88
	Second Swim, Fatigued Condition			
100-yd. free style (n=3)	+1.25	+1.70	−2.77	−3.80
100-yd. butterfly (n=3)	+0.78	+1.31	−0.37	−0.64
200-yd. free style (n=3)	+1.86	+1.30	−2.65	−1.85
200-yd. back stroke (n=3)	−1.74	−1.02	−1.36	−0.74
200-yd. breast stroke (n=3)	−0.71	−0.35	−0.65	−0.41

* Symbols defined in table 2; scores based on those in table 1.

competitive versus individual conditions or for the 2-hour versus 3-hour conditions. (Such a breakdown is given, however, in table 3).

As shown in table 2, amphetamine produced statistically significant improvement for both the 100-yd. swimmers and the 200-yd. swimmers during the first swim (rested condition) but produced significant improvement for only the 100-yd. men on the second swim (fatigued condition).

Table 3 shows the comparative effects of placebo and amphetamine (14 mg./70 kg.) on swimming times when the subjects swam alone (racing against the clock) and when they swam in competition (racing against each other). This table presents a further breakdown (within the individual condition and within the competition condition) of the effects of amphetamine when taken two hours before the first swim and when taken three hours before the first swim. The amphetamine versus placebo comparisons in table 3 give some indication that the amphetamine effects may have been slightly greater at three hours than at two hours after medication, especially on the second swim comparisons. However this tendency is not consistent enough to be more than suggestive. Consequently the description of results in the next two paragraphs will be limited to the comparisons combining the data obtained at the two time points.

For the first swim (rested condition) amphetamine produced improvement in both 100-yd. and 200-yd. men, both when the men swam individually and when they swam in competition. Swimming individually, the mean improvement scores were 1.24 seconds., 1.95 seconds, and 1.67 seconds for the 100-yd., 200-yd., and combined groups respectively. All three improvements were beyond the 0.10 level of significance. The corresponding improvement scores were 1.81%, 1.19%, and 1.44% (all beyond the 0.10 level of significance). When the subjects swam competitively the amphetamine improvement was not as great as that found when the subjects swam individually. The 10-yd. men obtained an improvement of 0.96 seconds. The 200-yd. men improved 0.77 seconds. The combined group improved 0.84 seconds. The corresponding improvement scores were 1.37%, 0.54%, and 0.87%. (See table 3 for "t" values and significance levels.) Although the 15 subjects obtained a greater mean difference between amphetamine and placebo when swimming individually than when swimming competitively, this difference did not reach the 0.20 level of significance.

On the second swim (fatigued condition) there was an interesting difference between the 100-yd. and 200-yd. swimmers under the competition condition. Whereas the 100-yd. men swam 0.66 seconds faster under the influence of amphetamine than under placebo ("t"=4.01; $p<0.02$) the 200-yd. men swam 2.17 seconds slower under influence of amphetamine ("t"=3.23; $p<0.02$). On the other hand, both groups of swimmers obtained an amphetamine improvement when swimming individually, although the improvement for the 200-yd. men was slight.

Table 4 presents information concerning the comparative effects of secobarbital and placebo, under rested and fatigued conditions, with a breakdown for individual and competitive conditions. On the first swim the 200-yd. men showed about the same impairment when swimming individually (2.87 seconds and 1.99%) as when swimming competitively (2.90 seconds and 1.92%). The 100-yd. men showed more impairment when swimming individually (1.41 seconds and 2.30%) than when swimming competitively (0.81 seconds and 1.32%).

On the second swim the 100-yd. and 200-yd. men showed an interesting difference in secobarbital effect. The 100-yd. men were impaired more than twice as much when swimming individually than when swimming competitively (2.20 seconds as opposed to 0.96 seconds), whereas the 200-yd. men showed just the reverse. They were impaired 0.97 seconds

when swimming individually and 2.07 seconds when swimming competitively. Both with respect to magnitude and percent effect, table 4 shows that on the second swim 100-yd. men were impaired to a statistically significant extent when swimming individually (but not when swimming competitively) while the 200-yd. men were impaired significantly when swimming competitively but not when swimming individually.

The 15 swimmers comprised five groups of three men each: 100-yd. free style, 100-yd. butterfly, 200-yd. free style, 200-yd. back stroke, and 200-yd. breast stroke. Table 5 shows that all five groups swam faster under influence of amphetamine than under placebo on the first swim. On the second swim the two groups of 100-yd. men and the 200-yd. free style group swam faster under influence of amphetamine than placebo but the 200-yd. breast stroke and 200-yd. back stroke groups swam slower under influence of amphetamine than placebo. On both first and second swims all five groups showed impairment under secobarbital (table 5).

Subject 9 increased the variability of the group greatly. Consequently the "t" values are low in spite of the fact that eight of the nine subjects improved during use of amphetamine.

As mentioned before, session 8 was carried out under atypical conditions. The statistical analyses were performed both including and excluding that session. The right half of table 6 presents the results obtained excluding session 8. The average improvement under amphetamine was 6.37 seconds ("t"=2.23; $p<0.10$). The corresponding improvement was 3.17% ("t"=2.46; $p<0.05$).

Both the analyses including session 8 and those excluding it show that the subjects ran slightly faster under secobarbital (50 mg. per 70 kg.) than under placebo. However, none of those comparisons reached the 0.20 level of significance.

Experiment 3.—Five of the eight subjects in experiment 3 ran faster under influence of amphetamine than placebo; three ran slower. Considered as a group, the subjects had an average amphetamine time which was 1.08 seconds faster than that

TABLE 6.—*Comparative Effects in Experiment 2, of Amphetamine Sulfate, Secobarbital, and Placebo on Performance Times of Nine Runners.**

Distance Run	Subject No.	All Sessions							Session 8 Excluded						
		Time in Seconds			P-A	P-A, %	P-S	P-S, %	Time in Seconds			P-A	P-A, %	P-S	P-S, %
		P	A	S	P	P	P	P	P	A	S	P	P	P	P
600 Yd.	1	84.03	83.43	81.80	+0.60	+0.71	+2.23	+2.65	82.85	83.43	81.80	−0.58	−0.70	+1.05	+1.27
	2	86.03	85.47	87.00	+0.56	+0.65	−0.97	−1.13	85.45	85.47	87.00	−0.02	−0.02	−1.55	−1.81
	3	90.07	87.93	89.60	+2.14	+2.38	+0.47	+0.52	90.07	87.93	89.10	+2.14	+2.38	+0.97	+1.08
1,000 Yd.	4	159.40	154.60	156.90	+4.80	+3.01	+2.50	+1.57	159.40	153.55	156.90	+5.85	+3.67	+2.50	+1.57
	5	182.53	176.40	180.15	+6.13	+3.36	+2.38	+1.30	182.53	167.80	180.15	+14.73	+8.07	+2.38	+1.30
	6	175.03	166.68	166.97	+8.35	+5.11	+8.06	+5.12	175.03	160.30	166.97	+14.73	+8.42	+8.06	+5.12
1 mile	7	296.80	280.60	287.10	+16.80	+5.66	+9.70	+3.27	296.80	280.60	287.10	+16.80	+5.66	+9.70	+3.27
	8	315.46	300.53	314.47	+14.93	+4.73	+0.99	+0.31	312.23	300.53	314.47	+11.70	+3.75	−2.24	−0.72
	9	291.90	308.67	306.43	−16.77	−5.75	−14.53	−4.98	291.90	280.90	306.43	−8.00	−2.74	−14.53	−4.98
Mean difference for nine runners					+4.24	+2.21	+1.30	+0.96				+6.37	+3.17	+0.80	+0.68
"t" values					1.30	1.91	0.56	1.00				2.23	2.46	0.34	0.70
Two-tailed probability values					NS	0.10	NS	NS				0.10	0.05	NS	NS

* Symbols defined in earlier tables.

Experiment 2.—Table 6 presents the results obtained with the nine runners who performed on an indoor track. The mean performance times under the influence of placebo, amphetamine (14 mg. per 70 kg.), and secobarbital (50 mg. per 70 kg.) are shown in columns 1, 2, and 3 respectively. Column 4 shows the difference between each subject's mean placebo time and his mean amphetamine time. Column 5 expresses that difference as a percent of the mean placebo time. Columns 6 and 7 show the corresponding magnitude and per cent comparisons for placebo versus secobarbital. The results of the statistical evaluations of these scores appear at the bottom of the table.

Column 4 shows that eight of the nine runners performed faster under influence of amphetamine than under placebo. The mean difference for the amphetamine-placebo scores is 4.24 seconds. The mean difference is 2.21%. These two mean differences yield "t" values of 1.30 and 1.91 respectively. for placebo. The corresponding percentage difference was 0.89%. However, neither of these comparisons reached the 0.20 level of significance. We believe this lack of significance was due partly to uncontrolled weather variables. (As mentioned before, this experiment was carried out during the winter on an outdoor track. The temperature varied from 25 to 69 F. The wind velocity varied from 8 to 23 miles per hour. To assess the effect of variations in temperature on running time, each subject's score on the warmest amphetamine day was subtracted from his score on the coldest amphetamine day; then the same was done for his two placebo days and two secobarbital days. The mean of these three difference scores was then obtained. The resulting score showed the effect of temperature, with the drug-effect controlled. Seven of the eight subjects ran faster on the warm days than on the cold days. The mean difference for the group was 2.89 seconds. A comparable analysis was performed to evaluate the

effect of variations in wind velocity. Seven of the eight subjects ran faster on the less windy days. The mean difference for the group was 2.20 seconds.)

Experiment 4.—Table 7 presents the results obtained with the nine marathon runners performing under placebo, secobarbital (50 mg. per 70 kg.), and three different dosages of amphetamine (7, 14, and 21 mg. per 70 kg. of body weight). Data obtained under the three dosage levels of amphetamine were combined in the comparisons shown in table 7. Six of the subjects ran faster under influence of amphetamine than placebo; three ran slower. Considered as a group the subjects ran an average of 24.12 seconds faster under influence of amphetamine than placebo ("t"=2.13; $p<0.10$). The mean difference was 1.07% ("t"=1.72; $p<0.20$).

As in experiment 3, the performances of experiment 4 occurred out of doors during late winter. Weather variable added to the variability of the

into the ground" in a hard 15-mile race wearing 10 lb. of clothing. The runner's written comments made after the race follow:

First I would like to say that I was wearing 10 pounds of clothing (my boots alone weighing 3½ lb.) in my 15 miles work out last night in which 'I ran myself into the ground.' This was the hardest work-out I'd had in months. Needless to say, I was very tired today. I feel therefore that had I done 6 miles (not too hard) instead of 15 miles last night, a time equal to or better than my best time of 33:25 would not have been unreasonable. I was thinking in terms of a 35 minutes-something, work-out before my first medication! And yet, after a ½ hr. sleep between capsules and just after my second, my mood and outlook changed substantially, so I estimated 34:40. However, while running my first 100 yards I wished I'd estimated even something around 36:00 minutes—my legs just wouldn't go and I felt very tired. But since I feel it a responsibility to do my very best in order to make these experiments worth while, I pushed myself hard and worked my arms harder than usual. I soon established a better racing pace but it was just one hell of a grind *all* the way. My time was 34:08,7! I was amazed that I could force myself so much today. My legs felt light and loose afterwards and I enjoyed a 2 mile jog. I have had a

TABLE 7.—*Comparative Effects, in Experiment 4, of Amphetamine Secobarbital, and Placebo on Performance of Nine Marathon Runners.**

Subject No.	Distance	Time in Minutes and Seconds			Comparative Times in Seconds			
					$\overline{P-A}$	$\frac{\overline{P-A}}{\overline{P}}$, %	$\overline{P-S}$	$\frac{\overline{P-S}}{\overline{P}}$, %
	Mi.	$\overline{P}$	$\overline{A}$†	$\overline{S}$				
1	7.0	48:39.00	48:09.00	49:07.50	+30.00	+1.34	− 28.50	−0.98
2	5.8	32:39.35	32:45.30	33:47.00	− 5.95	−0.30	− 67.65	−3.45
3	12.7	87:35.67	87:18.00	92:05.00	+17.67	+0.34	−269.33	−5.12
4	6.0	31:20.00	31:42.00	31:20.67	−22.00	−1.17	− 0.67	−0.04
5	6.8	42:20.00	41:18.00	41:38.33	+62.00	+2.44	+ 41.67	+1.64
6	4.5	26:04.00	26:28.00	27:02.00	−24.00	−1.53	− 58.00	−3.71
7	4.7	26:44.00	25:45.68	26:20.50	+58.37	+3.64	+ 23.50	+1.47
8	7.35	43:21.00	42:39.58	42:54.33	+41.42	+1.59	+ 26.67	+1.03
9	4.7	25:40.00	24:49.43	25:34.65	+50.57	+3.28	+ 5.35	+0.35
Mean difference for nine runners					+24.12	+1.07	− 36.33	−0.98
"t" values					2.13	1.72	1.15	1.17
Two-tailed probability values					0.10	0.20	NS	NS

* Dosages of 7, 14, and 21 mg. of amphetamine per 70 kg. of body weight and 50 mg. of secobarbital per 70 kg. of body weight were given.
† The three amphetamine dose levels were combined in obtaining the $\overline{A}$ values.

date and tended to reduce the statistical significance of the improvement shown under amphetamine by the group.

There were reasons for questioning the validity of the data contributed by all three of the subjects who ran faster under influence of placebo than amphetamine; however, the decision was made to retain their data. Subject 6 had only one placebo session. Subject 4 indicated on his performance analyses that 9 of his 12 performances (75%) were not "all-out" efforts. The corresponding average for the remaining eight subjects was 15%. All subjects had been asked to make each effort an "all-out" one. In general, subject 4 did not appear to grasp the concept of a controlled experiment. He was the subject who altered his course on one occasion. The result of one of his races was recorded in the wrong place. Other indications of failure to meet the requirements of the experiment were also found in his data.

Both the fastest time and slowest time for subject 2 occurred under the 21 mg. per 70 kg. dose of amphetamine. That slow amphetamine race occurred the day after the subject had "run himself tingling and chilled sensation of my body since the run. As a summary, I feel this was the most substantial mental and physical change I have ever experienced in such a short period of time.

To compare different dose levels, it was planned that each subject would run twice under each of three dose levels of amphetamine. Due to illness and adverse weather, only three subjects completed all sessions. Of the sessions run, three were discarded as mentioned under "method." Four of the nine subjects made only one run under the 7-mg. dose, five made only one run under the 14-mg. dose, and five made only one run under the 21-mg. dose. Furthermore, 10 of the sessions retained were performed under conditions of moderate physical impairment or weather adversity. These considerations require cautious interpretation of the data. The subjects ran faster on the average under 14-mg. doses of amphetamine than under 7-mg. doses, and still faster under the 21-mg. dose, but the factors mentioned cast doubt on the accuracy of the differences observed in results after use of the three dose levels. The subjects ran 0.06% slower, 0.30% faster, and 2.54% faster under the 7-mg.,

14-mg., and 21-mg. doses, respectively, than after taking the placebo. The first two comparisons were not significant at the 0.20 level. The third was significant beyond the 0.10 level. Because of the uncontrolled factors mentioned and because half the subjects had a given dose level only once, the comparisons at the three separate dose levels were less stable than the comparison combining all three. The standard error for the combined analysis was 0.62%, while those for the comparisons based on 7-mg., 14-mg., and 21-mg. dose performances considered separately were 0.89%, 0.83%, and 1.21% respectively.

Experiments 2, 3, and 4 Combined.—In all three experiments using runners as subjects, the groups ran faster under the influence of amphetamine than under placebo. The man improvement scores were 2.21%, 0.89%, and 1.07% for experiments 2, 3, and 4 respectively. This is slightly higher than the mean improvement found with the swimmers of experiment 1. In spite of this the statistical evaluations of the data obtained with the runners were in no case as convincing as those based on the data obtained with the swimmers. This was due in part to factors already mentioned which increased the instability of the data.

The data are stabilized somewhat by combining the three experiments. (The standard error for the analysis combining the percentage scores of experiments 2, 3, and 4 is only 0.60%; those for experiments 2, 3, and 4, considered individually, are 1.34%, 1.23%, and 0.62% respectively.) Since the various subjects ran various distances (440 yards to 12.7 miles) the combined analysis was performed on the percent scores ($\overline{P}$-$\overline{A}$/$\overline{P}$%) only. Combining the three groups yields a mean improvement under amphetamine of 1.40%. The "t" value for this combined analysis is 2.42, which almost reaches the 0.02 level of significance. A further combined analysis was carried out excluding session 8 in experiment 2. This produced a mean difference of 1.74% ("t"=2.75; $p<0.02$).

Experiment 5.—The nine 35-lb. weight-throwers and the four 16-lb. shot-putters contributed data which have been evaluated in terms of maximum distances thrown and mean distances thrown under each medication.

TABLE 8.—*Comparative Effects, in Experiment 5, of Amphetamine Sulfate, Secobarbital, and Placebo on Maximum Distances Thrown by Nine 35-lb Weight-Throwers and Four 16-lb Shot-Putters.**

Subject, No.†	Distance, Ft.‡ P	A	S	A-P	A-P, % P	S-P, % P	S-P, % A-S
WT 1	46.9	50.1	49.6	+3.2	+6.82	+2.7	+5.76	+0.5
WT 2	51.9	54.8	53.1	+2.9	+5.59	+1.2	+2.31	+1.7
WT 3	41.3	45.0	42.8	+3.7	+8.96	+1.5	+3.63	+2.2
WT 4	45.3	49.6	47.1	+4.3	+9.49	+1.8	+3.97	+2.5
WT 5	59.8	60.5	59.8	+0.7	+1.17	0.0	0.00	+0.7
WT 6	49.1	49.3	48.6	+0.2	+0.41	−0.5	−1.02	+0.7
SP 1	48.6	51.8	47.8	+3.2	+6.58	−0.8	−1.65	+4.0
SP 2	40.0	40.4	39.0	+0.4	+1.00	−1.0	−2.50	+1.4
SP 3	34.7	35.0	34.1	+0.3	+0.86	−0.6	−1.73	+0.9
SP 4	42.0	44.0	42.6	+2.0	+4.76	+0.6	+1.43	+1.4
WT 7§	47.5	45.5	45.0	−2.0	−4.21	−2.5	−5.26	+0.5
WT 8§	61.0	59.0	60.0	−2.0	−3.28	−1.0	−1.64	−1.0
WT 9§	48.0	49.0	43.8	+1.0	+2.08	−4.2	−8.75	+5.2

* Dosage of 14 mg. amphetamine sulfate per 70 kg. of body weight and 50 mg. of secobarbital per 70 kg. of body weight was given.
† 35-lb. weight-throwers are marked WT; 16-lb. shot-putters are marked SP.
‡ Symbols are defined in preceding tables.
§ Weight throwers whose data we judged to be unreliable, before determining which drugs were given on which days (see text).

TABLE 9.—*Comparative Effects, in Experiment 5, of Amphetamine Sulfate, Secobarbital, and Placebo on Mean Distances Thrown by Nine 35-lb Weight-Throwers and Four 16-lb Shot-Putters.*

Subject, No.*	Distance in Feet† P	A	S	A-P	A-P, % P	S-P, % P	S-P, % A-S
WT 1	42.91	42.98	44.63	+0.07	+0.16	+2.02	+4.71	−1.95
WT 2	47.99	49.71	49.11	+1.72	+3.58	+1.12	+2.33	+0.60
WT 3	39.20	42.44	40.12	+3.24	+8.27	+0.92	+2.35	+2.32
WT 4	42.41	46.44	44.90	+4.03	+9.50	+2.49	+5.87	+1.54
WT 5	55.69	57.19	56.16	+1.50	+2.69	+0.47	+.84	+1.03
WT 6	45.87	47.23	46.47	+1.36	+2.96	+0.60	+1.31	+0.76
SP 1	45.63	49.56	45.84	+4.39	+9.42	+0.21	+0.46	+4.09
SP 2	38.32	39.44	35.28	+1.11	+2.90	−3.05	−7.96	+4.16
SP 3	33.28	33.53	32.80	+ .25	+ .75	−0.48	−1.44	+0.73
SP 4	40.06	41.53	40.58	+1.47	+3.67	+0.52	+1.30	+0.95
WT 7‡	44.14	43.16	41.50	− .98	−2.22	−2.64	−5.98	+1.66
WT 8‡	50.02	55.00	57.10	−4.02	−6.81	−1.92	−3.25	−2.10
WT 9‡	42.99	45.67	39.72	+2.68	+6.23	−3.27	−7.61	+5.95

* 35-lb. weight-throwers are marked WT; 16-lb. shot-putters are marked SP.
† Symbols are defined in earlier tables.
‡ Weight-throwers whose data we judged to be unreliable, before determining which drugs were given on which days (see text).

Each man threw approximately 15 to 25 times each day. Each day a subject's maximum and mean throws were determined. The mean of each subject's maximum throws under each drug condition appears in table 8. Column 1 presents the mean of each subject's maximum throws for his placebo days. Columns 2 and 3 show the means of the maximum throws for the amphetamine and secobarbital days respectively. Column 4 shows the comparison of each subject's maximum score under influence of amphetamine with his maximum score under placebo. Column 5 expresses the amphetamine—placebo difference as a percentage of the placebo score.

Table 9 presents similar information concerning the effects of amphetamine and secobarbital on the mean distances thrown. Table 10 presents the results of statistical analyses of the data reported in tables 8 and 9.

Under "Method" we mentioned that the weight-throwing analyses were carried out both including and excluding the results obtained with three subjects whose data were sparse and in our judgment unreliable. Table 10 gives the results of four separate evaluations of each type of score: the first is based on the data of the six 35-lb. weight-throwers who contributed six or more sessions; the second is based on the data of the four 16-lb. shot-putters; the third combines these two groups; the fourth is based on the data of all 13 subjects, including the three subjects whose data are questionable.

Table 10 shows that all amphetamine versus placebo analyses based on the total group of 13 are significant beyond the 0.10 level. The analyses which

exclude the three subjects mentioned above yield even clearer demonstrations of an amphetamine effect. (All are significant beyond the 0.01 level.)

With regard to the maximum distance scores, the six weight-throwers and four shot-putters obtained average improvement scores of 2.50 ft. and 1.48 ft. respectively, under influence of amphetamine. The average improvement for the group of 10 was 2.09 ft. This group effect yields a "t" of 5.84, which is significant beyond the 0.001 level. The corresponding improvement scores for these three groups were 5.41%, 3.30%, and 4.56%.

The results obtained with the evaluation of mean distance scores are very similar to those obtained when the comparisons were made on the basis of maximum distance scores. Under amphetamine (14 mg. per 70 kg.) the 6 weight-throwers obtained an average improvement of 1.99 ft., the 4 shot-putters improved 1.78 ft., and the total group of 10 improved 1.91 ft. This average improvement of 1.91 ft. yields a "t" of 4.10, which is beyond the 0.01 level of significance. The corresponding average improvement scores are 4.53%, 4.19%, and 4.39% for the weight-throwers, shot-putters and combined groups respectively. Both with respect to maximum scores and mean scores the six 35-lb. weight-throwers obtained statistically significant improvement ($p<0.10$) under influence of secobarbital. The four 16-lb. shot-putters obtained impairment. The total group of 10 showed improvement for both maximum and mean scores but neither comparison reached the 0.20 level of significance.

Experiment 6.—Table 11 shows the average swimming time of each of the 16 swimmers under influence amphetamine and placebo. It also shows each subject's goal ("steak time"), the difference between his mean time under placebo and his mean time under amphetemine, and the percent improvement or impairment produced by amphetamine. Eleven of the 16 subjects swam faster under influence of amphetamine than placebo. Table 12 presents average magnitude and average percentage effects for the 6 100-yd. swimmers, for the 10 200-yd. swimmers, and for the 16 swimmers taken as a group. It also presents the results of the statistical evaluations of these comparisons. The average amphetamine improvement for the 6 100-yd. swimmers was 0.56 second; that for the 10 200 yd. swimmers was 0.68 second; that for the 16 men considered as a single group was 0.63 second. The total group "t" yields a mean difference of 0.63 second, of 2.14 which is significant beyond the 0.05 level. The mean improvement scores for the 6 100-yd. men, the 10 200-yd. men and the total group of 16 were 0.95%, 0.45%, and 0.64% respectively. The "t" value for the 0.64% improvement shown by the total group was 2.49, with a corresponding two-tailed probability values of <0.10, beyond the 0.05 level.

As mentioned before, two of the swimmers contributed data which we judged (before the drugs administered were known in the given cases) to be less reliable than that of the other 14 subjects. Eliminating these two subjects raised the mean improvement from 0.63 second to 0.71 second and changed the "t" value from 2.14 to 2.13. The mean improvement was raised from 0.64% to 0.72% and the "t" value changed from 2.49 to 2.50.

Table 13 presents the average magnitude and average percentage effects for each of the five subgroups of subjects. One man in each subgroup swam faster under the influence of placebo than of amphetamine. However each of the five subgroups, considered as a unit, swam faster under influence of amphetamine.

The sixth session was one in which the motivation and attitude of certain of the subjects may have been different from that of earlier sessions. Whether the whole group won steak dinners depended on the final performance of two of the subjects. On the other hand, five of the subjects had reached the "steak time" criterion on each of their first five performances and came to the sixth session knowing they had won their two steak dinners and could win no more. A final analysis was performed eliminating session 6. The results were very similar to those

TABLE 10.—*Statistical Evaluations, in Experiment 5, of the Comparative Effects of Amphetamine Sulfate, Secobarbital and Placebo on Performance of Nine 35-lb. Weight-Throwers and Four 16-lb. Shot-Putters. Comparisons Are Given Both in Terms of Average Magnitude of Effect and Average Per Cent of Effect for Both Maximum Scores and Mean Scores.*

	Average Magnitude of Effect*						Average Per Cent of Effect*					
	$\bar{A}$ vs. $\bar{P}$	"t"	p	$\bar{S}$ vs. $\bar{P}$	"t"	p	$\bar{A}$ vs. $\bar{S}$	"t"	p	$\bar{A}$ vs. $\bar{P}$	"t"	p	$\bar{S}$ vs. $\bar{P}$	"t"	p
Comparisons Based on Maximum Throws															
Six weight-throwers	+2.50	3.68	0.02	+1.12	2.32	0.10	+1.38	3.91	0.02	+5.41	3.44	0.02	+2.44	2.34	0.10
Four shot-putters	+1.48	2.13	0.20	−0.45	−1.25	NS	+1.93	2.75	0.10	+3.30	2.33	0.20	−1.11	−1.28	NS
Six weight-throwers plus Four shot-putters	+2.09	5.84	0.001	+0.49	1.22	NS	+1.60	4.72	0.01	+4.56	4.14	0.01	+1.02	1.14	NS
All 13 subjects	+1.38	2.43	0.05	−0.22	−0.43	NS	+1.59	3.55	0.01	+3.09	2.57	0.05	−0.42	−0.38	NS
Comparisons Based on Mean Throws															
Six weight-throwers	+1.50	3.42	0.02	+1.27	3.84	0.02	+ .72	1.21	NS	+4.53	3.09	0.05	+2.90	3.00	0.02
Four shot-putters	+1.78	2.93	0.20	−0.70	−0.86	NS	+2.48	2.62	0.10	+4.19	2.26	0.20	−1.91	−0.91	NS
Six weight-throwers plus Four shot-putters	+1.91	4.10	0.01	+0.48	1.01	NS	+1.42	2.52	0.05	+4.39	4.05	0.01	+0.98	0.82	NS
All 13 subjects	+1.29	2.10	0.10	−0.22	−0.44	NS	+1.52	2.42	0.05	+3.16	2.46	0.05	−0.54	−0.44	NS

* $\bar{A}$ vs. $\bar{P}$, $\bar{S}$ vs. $\bar{P}$, and, $\bar{A}$ vs. $\bar{S}$ values are mean difference values based on scores presented in tables 8 and 9.

obtained including session 6. The total group of 16 subjects swam an average of 0.67 second faster under influence of amphetamine than placebo ("t"=1.86; $p<0.10$). The corresponding improvement was 0.53% ("t"=1.89; $p<0.10$).

Data from Phase 1.–Fourteen swimmers and six runners were studied in phase 1 while medicated with placebo or 7 mg. of amphetamine per 70 kg. body weight. The results obtained with each subject are presented in table 14. That table also indicates the event performed by each subject, the number of placebo and amphetamine medicaments used, the time interval between taking the medicament and beginning the performance, and whether the event was performed individually or competitively. Since a wide range of distances is represented among these subjects (50 yd. to 440 yd. for the swimmers, and 440 yd. to two miles for the runners) we carried out statistical tests only on the percentage improvement or impairment scores shown in the last column on the right. Eleven of the 14 swimmers swam faster under influence of amphetamine than placebo. The mean improvement for the swimmers taken as a group was 0.53%. This group improvement yields a "t" value of 2.04, which is beyond the 0.10 level of significance using a two-tailed test. The nine subjects who swam individually contributed considerably more to the group improvement than did those five who swam in competition.

Two of the six runners ran faster under influence of amphetamine than placebo. Four ran slower. The average impairment was 0.40% and did not reach the 0.20 level of significance.

TABLE 11.–*Comparative Effects, in Experiment 6, of Amphetamine Sulfate and Placebo on Performance Times of Sixteen Subjects Swimming under Rested Conditions Two Hours After Medication.*

Subject No.	Time in Seconds "Steak Time" Goal	$\bar{P}$	$\bar{A}$	$\bar{P}-\bar{A}$	$\frac{\bar{P}-\bar{A}}{\bar{P}}$, %
Free style, 100 yd.					
1	55.20	55.68	54.58	+1.10	+1.98
2	58.20	58.31	57.30	+1.01	+1.73
3*	55.50	56.83	57.00	−0.17	−0.30
Butterfly, 100 yd.					
4*	62.50	63.46	62.67	+0.79	+1.24
5	66.20	66.23	65.11	+1.12	+1.69
6	75.80	77.18	77.70	−0.52	−0.67
Free style, 200 yd.					
7	136.20	130.50	130.21	+0.28	+0.29
8	136.20	136.28	137.55	−1.27	−0.93
9	136.10	137.80	136.33	+1.47	+1.07
Back stroke, 200 yd.					
10	158.20	157.39	154.98	+2.41	+1.53
11	165.20	166.80	167.79	−0.99	−0.54
12*	142.00	145.08	141.71	+3.32	+2.29
Breast stroke, 200 yd.					
13*	158.20	156.13	155.54	+0.59	+0.38
14*	171.20	176.74	177.09	−0.35	−0.20
15	175.00	174.31	173.37	+0.94	+0.54
16	171.20	171.47	171.28	+0.19	+0.11

* Subjects 3, 4, 12, 13, and 14 were the five who swam alone. The others swam in competition—groups of two or three men.

Comment

Problems of Control.–Detailed and perhaps tedious descriptions have been given of the attempts made in the various experiments to control all factors which might influence the comparisons of amphetamine and placebo. Where weather variables, lack of interest, or cooperation on the part of subjects or other factors appeared to influence the results, we have so indicated. The reader has been burdened with these details because we believe they are essential to evaluation of the results presented. A perfectly "controlled" experiment on the behavior of human subjects is an ideal rarely if ever achieved. In the experiments presented above, three things were done to maximize control over extraneous factors. First, the cooperation of the subject was sought by explaining the general purpose of the investigation and by stressing the fact that he was more than just the subject. We tried to inspire all subjects to meet the responsibilities imposed by the experiment. An overwhelming majority of the subjects did so.

TABLE 12.–*Statistical Evaluations in Experiment 6, of the Comparative Effects of Amphetamine Sulfate and Placebo on Performance Times of Sixteen Subjects Swimming Under Rested Conditions Two Hours After Medication.*

	$\bar{P}-\bar{A}$*	"t"	$\bar{P}$	$\frac{\bar{P}-\bar{A}}{\bar{P}}$, %	"t"	$\bar{P}$
100-yd. swimmers (n=6)	+0.56	1.80	0.20	+0.95	2.08	0.10
200-yd. swimmers (n=10)	+0.68	1.50	0.20	+0.45	1.49	0.20
Combined groups (n=16)	+0.63	2.14	0.05	+0.64	2.49	0.05
Analysis eliminating two subjects (n=14)	+0.71	2.13	0.10	+0.72	2.50	0.05

* $\bar{P}-\bar{A}$=mean difference values based on the $\bar{P}-\bar{A}$ scores presented in table 11.

† $\frac{\bar{P}-\bar{A}}{\bar{P}}$, %=mean difference values based on the $\frac{\bar{P}-\bar{A}}{\bar{P}}$, % scores presented in table 11.

TABLE 13.–*Comparative Effects of Amphetamine Sulfate and Placebo on Performance Times of Five Groups of Subjects, Swimming Under Rested Conditions Two Hours After Medication.*

	$\bar{P}-\bar{A}$*	$\frac{\bar{P}-\bar{A}}{\bar{P}}$, %†
100-yd free style swimmers (n-3)	+0.65	+1.14
100-yd butterfly swimmers (n-3)	+0.46	+0.75
200-yd free style swimmers (n-3)	+0.19	+0.14
200-yd back stroke swimmers (n-3)	+1.61	+1.00
200-yd breast stroke swimmers (n-4)	+0.34	+0.21

* $\bar{P}-\bar{A}$ = mean difference values based on the $\bar{P}-\bar{A}$ scores presented in table 11.

† $\frac{\bar{P}-\bar{A}}{\bar{P}}$, %=mean difference values based on the $\frac{\bar{P}-\bar{A}}{\bar{P}}$, % scores presented in table 11.

Second, devices were developed to enable the subject to report his subjective reactions before, during and after each performance. This material will be reported subsequently.

Third, the experiments were designed so that each subject would be studied several times under

each drug, the aim being to minimize the effects of inevitable chance factors which might influence any single performance.

Recapitulation of Findings.—The experiments presented above indicated that 14 mg. of amphetamine per 70 kg. of body weight taken two to three hours before running, swimming, or weight throwing improved the performance of the athletes, considered as groups. (Some individuals in each group showed impairment rather than improvement). In the first experiment, 14 of the 15 swimmers (93%) were helped by amphetamine when swimming under rested conditions and 67% were helped when swimming under fatigued conditions. In experiment 6, swimming under rested conditions at maximum or near maximum motivation, 69% were helped. Of the 26 runners tested under rested conditions in experiments 2, 3, and 4, 73% were helped. Eighty-five percent of the weight-throwers tested under rested conditions were helped. The improvement shown by all three groups of athletes was statistically significant. The levels are indicated above.

In terms of the amount of improvement shown by the three classes of subjects, the weight-throwers were first. As a group they showed an improvement of from 3 to 4%. The 26 runners had a mean improvement of approximately 1.5%. The swimmers showed varying degrees of improvement in the various test situations (from 0.59 to 1.16%). The amount of improvement shown has practical importance as well as statistical significance. The subjects of this study were highly trained athletes. Such individuals may spend months working for an improvement of 1 or 2%.

The 100 mg. per 70 kg. dose of secobarbital produced a significant impairment in the performance of the subjects (15 swimmers in experiment 1) receiving it. The 50 mg./70 kg. dose produced effects which were in general not significant. Two groups of runners showed slight impairment, and one group showed slight improvement of performance. The weight-throwers obtained a slight improvement. One subgroup of subjects in the latter study obtained an improvement in performance under 50 mg. of secobarbital which was statistically significant. (The secobarbital was used primarily to prevent the subject from correctly assuming he had received a "pep pill" whenever he thought he perceived drug-effects. It was also included to permit a study of the relationship between mood change and change in performance. Both amphetamine and secobarbital are thought to have euphoretic power. Data concerning these questions will be presented later.)

Considered as groups, the 15 swimmers of experiment 1 and the 17 runners of experiments 2 and 3 performed poorer (under placebo) during the experimental sessions than during meets with other schools. No such comparison was possible with the 9 marathon runners because they did not run competitive distances for the experiment. Considered as a group, the 13 weight-throwers threw as far in the placebo experimental sessions as in meets. The 16 swimmers of experiment 6, who performed under the special motivation described above, achieved experimental times which were, in general, equal to their meet times.

TABLE 14.—*Comparative Effects of Amphetamine Sulfate and Placebo on Performance Times of Six Runners and Fourteen Swimmers.**

Subject No.	Distance of Performance, Yd.	Type of Performance	Hr. After Medication	Competitive or Individual	#P	$\bar{P}$	#A	$\bar{A}$	$\bar{P}$-$\bar{A}$	$\frac{\bar{P}-\bar{A}}{\bar{P}}$, %
Runners										
1	3,520		1	I	3	10:03.55	3	10:28.13	−24.58	−4.07
2	1,760		1	I	3	5:20.27	3	5: 9.23	+11.04	+3.45
3	440		1	I	3	50.38	3	50.95	− 0.57	−1.13
4	440		1	I	3	55.09	3	54.70	+ 0.39	+0.71
5	880		1	I	3	2:24.32	3	2:24.50	− 0.18	−0.12
6	880		1	I	3	2:09.85	3	2:11.42	− 1.57	−1.21
Swimmers										
1	440	free style	2.5	C	4	5:14.13	4	5:18.75	− 4.62	−1.47
2	440	free style	2.5	C	3	5:01.6	3	5:02.9	− 1.30	−0.43
3	75	free style	2.5	C	4	38.63	3	38.50	+ 0.13	+0.34
4	50	free style	2.5	C	3	23.1	3	22.87	+ 0.23	+1.00
5	50	free style	2.5	C	3	25.47	3	25.23	+ 0.24	+0.94
6	75	butterfly (dolphin)	1	I	3	47.80	3	47.00	+ 0.80	+1.67
7	75	free style	1	I	3	41.17	3	41.15	+ 0.02	+0.05
8	75	free style	1	I	3	39.70	3	39.63	+ 0.07	+0.18
9	75	free style	1	I	6	39.25	6	38.57	+ 0.68	+1.73
10	200	free style	1	I	3	2:12.50	3	2:10.77	+ 1.73	+1.31
11	100	free style	1.75	I	9	61.02	5	61.56	− 0.54	−0.88
12	100	butterfly (dolphin)	1.75	I	7	71.59	4	71.28	− 0.31	+0.43
13	440	free style	1.75	I	10	5:28.52	5	5:24.34	+ 4.18	+1.27
14	75	butterfly (wedge)	1	I	3	49.70	3	49.10	+ 0.60	+1.21

* #P and #A indicate the number of placebo and amphetamine sessions, respectively. The other symbols are defined in earlier tables. The $\bar{P}$ and $\bar{A}$ times are expressed in minutes and seconds. See text for report on statistical analysis of above data.

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Generalization Concerning Intercollegiate Competition.—The findings presented above do not prove that athletes performing in intercollegiate meets would be helped by amphetamine. Practical considerations prevented our testing the drug under conditions of official school competition. However, experiments 5 and 6 succeeded in obtaining "all out" efforts from the subjects and thus provided pertinent information which should be stressed. Experiment 6 was designed specifically to stimulate maximum effort and to approximate the psychological atmosphere of a competition with another college. The 16 subjects, considered as a group, swam as fast during the experimental sessions as they had during meets with other schools. Under these circumstances amphetamine produced an improvement in performance which was significant beyond the 0.05 level.

In experiment 5 the 13 weight-throwers achieved experimental performances which were as good as those they achieved in intercollegiate meets. Here, also, amphetamine produced an improvement for the group which had both practical and statistical significance. The average improvement was from 3 to 4%.

Both the subjective data to be reported subsequently and the measured performance data reported above, indicate that amphetamine sulfate, in the 14 mg. per 70 kg. of body weight dose, taken two to three hours before an intercollegiate meet will improve the performance of the majority of runners, swimmers, and weight-throwers.

Summary and Conclusions

Six experiments were carried out on swimmers, runners, and weight-throwers to determine whether amphetamine sulfate in the dose of 14 mg. per 70 kg. of body weight improves the measured performance of such athletes. The experiments employed the double-blind procedure, placebos, and additional comparison medications (50 and 100 mg. per 70 kg. of secobarbital). Eighteen swimmers were studied a total of 453 times, 26 runners gave 205 performances, and 13 weight-throwers gave 123. The medicaments were given orally, and the performances were measured from two to three hours after the subjects had taken either amphetamine or placebo. The experimental conditions maintained and the methods used to evaluate performance were described in detail. The results of each experiment were evaluated statistically. Data obtained in an exploratory investigation using a smaller dose level of amphetamine (7 mg. per 70 kg.) were also reported.

In all three classes of athletes, the majority of subjects performed better under influence of amphetamine (14 mg. per 70 kg.) than placebo. The improvement was statistically significant for all three classes of athletes. Eighty-five per cent of the weight-throwers, 73% of the runners, and from 67 to 93% of the swimmers performed better under influence of amphetamine than placebo. The weight-throwers obtained the greatest amount of improvement from amphetamine (from 3% to 4%); the runners obtained an improvement of approximately 1.5%; the swimmers showed varying degrees of improvement in the various test situations (from 0.59 to 1.16%). The relationship of the data obtained to the use of amphetamine in intercollegiate competition was discussed.

This study has shown that the performance of highly trained athletes, of the classes studied, can be significantly improved in the majority of cases (about 75%) by the administration of amphetamine.

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INCREASING IMPORTANCE OF LEUKEMIA.—A disease which has doubled its incidence in 9 years is worthy of attention, even if it presents only a comparatively small threat to public health.

In Western Germany the number of deaths registered as due to leukaemia, including aleukaemia leukaemia, doubled between 1948 and 1956. The increase was greater in women than in men, so that the previously marked difference in incidence between the sexes has been narrowed. The greatest increase has taken place in old people; certain other age groups show little or no increase. Part of the increase may be due to improvement in medical care, but it remains open to what extent this factor is responsible.—G. Neumann, The Mortality from Leukaemia in Western Germany from 1948 to 1956, *German Medical Monthly*, March, 1959.

EFFECT OF AMPHETAMINE SULFATE ON ATHLETIC PERFORMANCE

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Recently there has been a great deal of agitation regarding the use of amphetamines in athletics. This agitation has been based mainly on rumors or secondhand information regarding one or two athletes who reportedly have admitted the use of amphetamine (Benzedrine) sulfate. It is, however, not known how these athletes would have performed with and without this drug under conditions of a controlled experiment.

While it is well known that amphetamines can cause euphoria and various degrees of insomnia which prolong wakefulness which might be used for activity, no reliable evidence exists that amphetamines are effective in increasing either endurance or speed in athletic activities. For this reason, the present study was undertaken. This study was so designed that it would be possible to detect the effect of the drug on endurance, recuperative ability, and speed of athletic performance under two conditions: "laboratory" conditions and under emotional stress during actual athletic competition.

Methods

Activities.—The following activities were included: (1) running to exhaustion on an electrically driven treadmill at 7.2 mph and 5-degree inclination twice in succession with a 10-minute rest in between the runs, (2) swimming 100 yd. as fast as possible twice in succession with a 10-minute rest in between, (3) swimming 220 and 440 yd. once on each testing day, (4) running 220 yd. on an outdoor track for time trials, and (5) running various distances (from 100 yd. to 2 miles) during competition. Altogether 532 tests were used for statistical analysis.

All "laboratory" experiments consisted of six tests done on six different days, three times with the drug and three times with a placebo. Experiments during actual contests were planned so that each subject would run from four to eight times, one-half of the runs with amphetamine and one-half without. However, since it was not always possible to know ahead of time what subject would take part in the contest, the number of tests and the order of administration of the drug and placebo varied.

Medication.—From the standpoint of medication, this study may be divided into two parts. In 1958 all but four subjects were given a capsule of 10 mg. of amphetamine sulfate one hour before the test. These four subjects received 20 mg. 30 minutes before the test. The drug and the placebo were administered from six coded bottles and given to subjects in rotating order. Neither I nor my assistants knew the code, which was kept in the A. M. A. headquarters on my request.

*Mean Time (in Seconds) of Performance With and Without Amphetamine**

	Swimming 100 Yd. (11 Men)			Swimming		Track			Treadmill (11 Men)			Treadmill (10 Men)			Treadmill (Special Group of 4 Men)		
				220 Yd. (16 Men)	220 Yd. (11 Men)	440 Yd. (9 Men)	220 Yd. (9 Men)	Competition† (12 Men)									
	1st Swim	2nd Swim	Difference						1st Run	2nd Run	Difference	1st Run	2nd Run	Difference	1st Run	2nd Run	Difference
Amphetamine	62.34	62.81	0.47	166.62	154.2	311.6	25.13	99.4	280.06	281.63	100.43	241.40	232.79	8.61	232.2	169.8	62.4
Placebo	62.33	63.20	0.87	169.64	153.6	311.0	25.15	100.0	388.24	270.72	118.52	256.60	227.41	31.16	249.7	148.2	101.5
Amphetamine minus placebo	0.01	−0.39	−0.40	−1.02	−0.4	0.6	−0.02	−0.6	−7.18	1.91	−9.09	−17.20	5.35	−22.55	−17.5	21.6	−39.1
Amphetamine, 1st plus 2nd	125.15								672.69			474.19			402.0		
Placebo, 1st plus 2nd	125.53								677.98			486.04			397.9		
Amphetamine total minus placebo total	−0.38								−5.27			−11.85			4.1		

* Subjects in each group, except "Treadmill (10 Men)," received at least 6 tests. In this group only 4 tests were given. Analysis of variance of performance time and also of variance in time differences between first and second "runs" in swimming and treadmill running showed no statistically significant differences between effects of amphetamine and placebo.

† Varsity meets, 100, 220, and 440 yd.; ½, 1, and 2 miles. Time of running with the placebo was taken as 100%.

In 1959, although the drug and the placebo were administered from coded bottles, I, but not my assistants, knew the code. This was done in order to expedite the detection of individuals who were affected either beneficially or deleteriously by the drug so that they could be subjected to additional tests. In 1959 all subjects received 20 mg. of amphetamine or placebo 30 minutes before the test. In both series, the placebo was made of calcium lactate.

Subjects.—All subjects were male college students. Most swimmers and all trackmen were varsity men. All the treadmill runners, some of whom were also varsity men, received preliminary training in running on the treadmill. Twenty-five men were used on the treadmill, 18 in swimming, and 11 in track time trials during competition. Altogether, 54 subjects were used. All subjects had a medical examination. Blood pressure and pulse rate were taken on several occasions one-half hour and one hour after medication. Since no particular variations were observed, this procedure was discontinued.

From the Department of Physiology, Springfield College.

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Results

Treadmill Runs.—Tests with 10 mg. of amphetamine given to 11 subjects one hour before the run showed no evidence of either a beneficial or deleterious effect of the drug on the endurance and recuperation from fatigue. From the table it may be seen that the average times for the first runs were 391.06 seconds with the drug and 398.24 seconds with the placebo. The duration of the second run was 281.63 seconds with the drug and 279.72 with the placebo. The average total times were 672.69 seconds and 677.96 seconds respectively. Analysis of variance of times showed that the differences between the figures in each pair were not statistically significant.

Tests with 20 mg. of amphetamine given to 10 subjects one-half hour before the run also gave no statistically significant difference (see table).

Tests with Amphetamine on a Special Group: Four men, highly interested in the experiment and therefore highly motivated to do their utmost, were each tested seven times. Most of the subjects felt a sense of euphoria after taking the capsule containing 20 mg. of amphetamine, the effect being noticeable about 30 minutes after taking the capsule. They also thought that they could run longer when they felt this effect, but they did not.

It may be observed from figure 1 that the best times for the first runs were obtained by all subjects during the last session regardless of the chemical taken: two of the subjects had taken amphetamine and the other two a placebo. The psychologi-

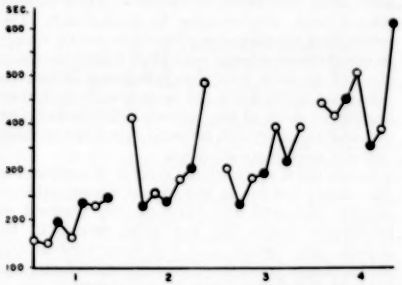

Fig. 1.—Effect of amphetamine (20 mg. taken one-half hour before test) on treadmill running time. Speed, 7.2 mph; angle of inclination, 5 degrees. (Solid dot, amphetamine; open dot, placebo.)

cal effect of the knowledge that it was the last test was obvious. Although the average results obtained for the entire group are the same as those obtained in other treadmill experiments, there was a definitely different reaction on the part of one of the subjects. Subject 3 (figure 1) exhibited a deleterious effect of amphetamine. His drug times were shorter than the placebo times. The average drug time was only 284 seconds, whereas the placebo time was 357 seconds. Unfortunately this subject was not available for further experimentation. Subject 2 showed a puzzling behavior occasionally observed in experiments involving endurance testing and not related to the chemicals consumed. His first and last runs were the best. Since the improvement in the last run had psychological reason, a similar interpretation may be suggested regarding the first run.

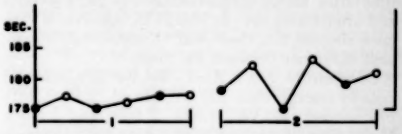

Fig. 2.—Effect of amphetamine (20 mg. taken one-half hour before the test) on speed of swimming 220 yd. Part 1 was obtained during the swimming season and part 2 after season. (Solid dot, amphetamine; open dot, placebo.)

Swimming.—Tests were made with 10 mg. of amphetamine given to 11 subjects one hour before swimming 100 yd. The average time for the first swim was 62.34 seconds with the drug and 62.33 with the placebo. For the second swim the times were 62.81 and 63.20 seconds respectively (see table). Analysis of variance showed that these differences were not statistically significant. Thus no beneficial or deleterious effect of amphetamine was observed on either the speed of swimming or recuperation from fatigue.

Tests were also made with 20 mg. of amphetamine given 30 minutes before swimming. Nine subjects swam 440 yd. The average drug time was 311.6 seconds and the placebo time 311.0. Two groups of subjects swam 220 yd. In one group, consisting of 16 men, the average drug time was 168.62 seconds and placebo time was 169.64 seconds. In the second group, consisting of 11 men, the times were 151.2 and 151.6 seconds respectively. Statistical analysis showed that the difference between each pair of figures was not statistically significant.

Inspection of the time graphs made for each subject showed that there were three subjects whose speed was increased by the amphetamine. Figure 2 shows a time graph prepared for one of these subjects. This graph consists of two parts. Part one was obtained when the subject was at the peak of condition. During this period, one can see a trend. The two fastest times were made with the drug during part two, after the swimming season was over, and the subject's speed fluctuated eight seconds instead of two seconds as in part one. The effect of amphetamine was observed each time he took the drug. The second man, a much faster man whose time varied from 143 seconds to 146 seconds, swam faster each time he took amphetamine. Without the

drug, his average time was 146 seconds; with the drug it was 143.3 seconds. One subject swam 440 yd. faster each time with amphetamine than with placebo. This average drug time was 301.6 seconds, and placebo time was 303.3 seconds. His swimming time for 220 yd., however, was not affected.

Track Running with Amphetamine Taken One Hour Before Test.—Nine varsity men were tested six times, after taking 10 mg. of amphetamine, each in time trials for 220-yd. runs. The average running time after taking amphetamine was 25.13 seconds and after taking the placebo 25.15. Analysis of variance showed that there was no statistically significant difference between the times.

Competitive Track Runs.—Twelve men made 65 runs in seven events: 100 yd., 220 yd., 220 yd. with low hurdles, 440 yd., ½ mile, 1 mile, and 2 miles. If the time of running after taking the placebo is given a value of 100%, the average time of running after taking the drug is 99.4%. The best time was

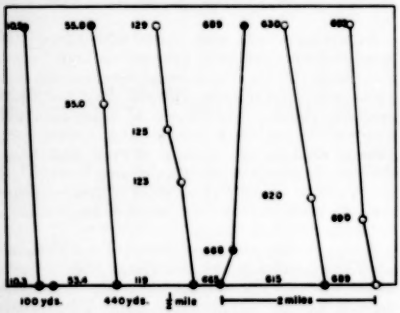

Fig. 3.—Time graphs obtained during intercollegiate track meets. Running time of some subjects improved and that of some deteriorated regardless of the chemical taken. (Solid dot, amphetamine [20 mg., one hour before the run]; open dot, placebo.)

made 11 times with the drug and only 9 times with the placebo. There were two ties. This observation, however, cannot be accepted as even an indication of a trend.

An inspection of the individual time graphs shows a disturbing fact (fig. 3). Some runners showed a consistent improvement in speed and some a consistent deterioration in performance regardless of the chemical taken.

Looking at the 100-yd. record, one may assume that this man improved under the influence of the amphetamine. The 440-yd. man improved also, even though before his second run he received the placebo. The half-miler kept on improving while getting placebos, and one may suppose that he would have improved during his last run if the placebo instead of amphetamine had been given (as happened with the last two-miler). The first two-miler's performance became steadily worse in spite of or because of amphetamine.

Comparison of weather and track conditions with the records failed to show any relation. If by chance tests were made only on subjects 1, 3, or 5, conclusions could be drawn that amphetamine increases the speed of running. The graphs 4 and 6 in figure 3 will make one wonder. It is quite possible that these steady changes in performance are not related to the effect of the drug at all.

Subjective Reports

Subjects were asked to report any unusual sensation, comfortable or otherwise, and whether they slept well or not. When 10 mg. of amphetamine was given, the placebo was blamed or praised as often as the drug. When 20 mg. was given, the subjects were 75% correct in guessing when they had been given the "pep pills." Some complained of difficulty sleeping. The latter was remedied equally well by a sedative or another capsule of placebo. The four subjects in the special treadmill group usually guessed correctly when amphetamine was administered. In this group there was a man from India who had never taken any drugs in his life and was at first reluctant to join in the experiment. He could always guess correctly whether it was a drug or a placebo that had been taken. However, this did not affect his running time.

Comment

During the experiment subjects did not know what drug was being investigated. Their guesses ranged from amphetamine to tranquilizers. The medication schedule was adhered to strictly except in one instance when a man, after taking the drug, ran half an hour later than scheduled. When, on one occasion, trackmen did exceptionally well, they begged for more of the "miracle pills." Subsequent examination of records revealed that some of these "miracle pills" were placebos.

Examination of individual records of competitive runs shows that for no known reason some athletes steadily improved and some steadily declined in proficiency during the last three meets. If, by chance, only certain men had been used in this study, results could have been either definitely in favor of or definitely against amphetamine.

Four subjects in the special treadmill group gave their best performance during the last test. It was fortunate that two of them had received amphetamine and two the placebo. If they all had received the same chemical, interpretation of the results would have been more difficult.

There are other stumbling blocks which may be encountered. On one occasion, a subject improved his endurance 88% (from 402 seconds to 756 seconds) after taking 10 mg. of amphetamine. However, a few days later another man, running after

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taking 10 mg. of placebo, improved his endurance more than 132% (from 860 seconds to 2,000 seconds). He ran on three more occasions, twice with the drug and once with the placebo, but his time never surpassed 958 seconds. This particular man was a good distance runner and very cooperative. He could not offer any acceptable explanation of his phenomenal run. Such unusually long running times immediately arouse a suspicion that these two men were not always running to the limit of their ability, a suspicion easily aroused when tests depend on maximum voluntary performance. However, there was no other tangible evidence on which to suspect these two subjects of shirking their pledges, and they were retained in the experiment.

Observations similar to this have been made by me during other experiments involving endurance. No suitable explanation has ever been found.

The results obtained during track contests were different from those obtained on the same men during the 220-yd. trials. Whereas during the trials no effect on performance was discovered, the data obtained during athletic competitions could be interpreted in a manner fitting the fancy of the interpreter. All reports regarding the ergogenic action of chemicals obtained from studies of single individuals or small groups should be regarded with extreme caution. It is also advisable to plot performance graphs for each subject, so that any unusual reaction can be discovered immediately and followed up with additional tests.

Summary and Conclusions

In an investigation of the effect of amphetamine sulfate on the athletic performance of 54 male college students, the drug was given in doses of 10 and 20 mg., either one hour or one-half hour before the test. Activities used were as follows: running to exhaustion on a treadmill twice in succession with a 10-minute rest in between, running 220-yd. track time trials, running distances from 100 yd. to 2 miles under competitive conditions, swimming 100 yd. twice in succession with a 10-minute rest in between, and swimming 220 and 440 yd. Altogether 532 tests were statistically analyzed. All subjects but four showed neither beneficial nor deleterious effects of 10 or 20 mg. of amphetamine. Three of the four subjects definitely improved in swimming 220 yd., while one improved in swimming 440 yd. One treadmill subject showed a deleterious effect of amphetamine. He ran longer after taking the placebo than after the amphetamine. Thus, three of the subjects were definitely benefited by the amphetamine, and one man was affected deleteriously. All these men received 20 mg. of amphetamine.

I wish to thank Messrs. Derwood Stetson, John Hick[illegible] Chalasani Rao, and Coach Charles E. Silva and his staff assistance with the experimental work; Drs. Clifford [illegible] Keeney and Emery Seymour for statistical help; and Miss Clare E. Condron and Mr. Richard McCorkle for assistance in preparation of the manuscript.

This study was aided by a grant from the American Medical Association.

MYXEDEMA.—Myxedema is the commonest form of thyroid disease seen by the physician. . . . Since the use of radio-iodine therapy has become widespread, two types of decreased thyroid function are seen. The first is a transitory state occurring about three to six months after therapy, which we have called hypothyroidism. The patient complains of feeling the cold and of gain in weight, while the diastolic blood pressure has always been found to be elevated in these patients. They do not show the florid features of myxedema and respond well to replacement therapy with moderate doses of thyroid gland extract. The importance of the separation of this group is that the symptoms are temporary and, after six months' therapy, the thyroid apparently recovers. It is probably due to temporary excess destruction of the secreting tissues, or to too prolonged use of antithyroid drugs after radioactive iodine therapy. Unfortunately, typical permanent myxedema may be seen after radio-iodine therapy . . . (most figures vary between 5% and 10%). The recent discovery of triiodothyronine and the acetic acid derivatives has stimulated investigation of their use in myxedema. All these substances have been found to be effective in relieving symptoms, but it is generally agreed that they are not suitable for general use. Triiodothyronine is two to five times more potent than thyroxine. Its action is rapid and may therefore precipitate cardiac complications in the elderly. There is a very definite withdrawal syndrome, seen within 24 hours of ceasing therapy. There is a rapid return of the symptoms and signs of myxedema, which may be even more severe than before treatment. This, of course, is explained by the rapid dissociation of triiodothyronine from the globulin in the serum to the intracellular department. Its main use is in myxedema coma, in which it may be life-saving.—W. E. King, Medical Aspects of Thyroid Disease, *The Medical Journal of Australia*, Dec. 20, 1958.

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USE OF AMPHETAMINES IN ATHLETICS

GUEST EDITORIAL

Allan J. Ryan, M.D., Meriden, Conn.

IN JUNE, 1957, a resolution presented to the House of Delegates of the American Medical Association condemned what was alleged to be a widespread use of amphetamine substances by coaches, trainers, and athletes to improve athletic performance. As a result, the Board of Trustees appointed a special committee to investigate these charges. The *ad hoc* Committee on Amphetamines and Athletics conducted a survey of opinions and practices among those connected with the direction and training of athletes. This was done with the cooperation of the National Collegiate Athletic Association, the National Association of Intercollegiate Athletic Associations, and the National Federation of High School Athletic Associations. After many contacts with physicians and other persons connected with amateur and professional sports, the Committee reported to the Board of Trustees that the observed use of these drugs is apparently very small.

A review of the available literature relating to the pharmacology and uses of the amphetamines failed to reveal any well-substantiated evidence that any improvement in athletic performance could be expected as the result of their administration. Dr. Henry K. Beecher, a member of the Committee, therefore volunteered to undertake a study at Harvard University in order to help answer this question. In the meantime it was discovered that Dr. Peter V. Karpovich had already planned a similar investigation at Springfield College in Massachusetts. The Board of Trustees agreed to provide financial support to the Harvard project and assistance to the Springfield investigation. Dr. Karpovich agreed to consult with the Committee regarding his plans and his findings.

The results of these two investigations, which were conducted independently and according to quite different plans, are published in this issue of THE JOURNAL. The Harvard study clearly shows that, when amphetamine is given in a large enough dose (14-21 mg. per 70 kilograms of body weight) and from two to three hours before the test, improvement in speed performance of runners and swimmers, and distance achieved by weight throwers, occurs in about 75% of trained athletes. The Springfield study, using smaller doses with a much shorter time interval (one-half to one hour) showed improvement in performance in only three instances.

Since the use of any drug to improve athletic performance has already been made grounds for disqualification by the International Amateur Athletic Federation, the Amateur Athletic Union, and the United States Olympic Association as being contrary to the highest ideals of sportsmanship, and since the use of amphetamines even in moderately small doses is known in many instances to result in habituation and harmful effects, the Committee has recommended that the use of amphetamines for this purpose be condemned. Because these drugs can be obtained legally only on prescription, a serious obligation devo[illegible]s on physicians to help prevent such usage by prescribing them only for well-recognized medical indications. It is acknowledged there is an illegal traffic in the amphetamines in the United States and that problems of its control still remain to be solved.

Chairman, A. M. A. *ad hoc* Committee on Amphetamines and Athletics.

MEDICAL LICENSURE

In the 57th annual report on medical licensure prepared by the Council on Medical Education and Hospitals, which appears in this issue, data are presented concerning the medical examination and the licensure of physicians in the United States and its territories and outlying possessions for 1958. The report also summarizes trends in licensure over many years and presents current regulations pertaining to medical licensure. A section is included pertaining to boards of examiners in the basic sciences and the National Board of Medical Examiners.

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The report calls attention to the nine workshops conducted over a three-year period by the Federation of State Medical Boards of the United States. At these workshops major areas of concern the evaluation of fitness of a state board of medical examiners were subjected to a critical analysis. Relation of concern by a state board to the status of medical education as it exists today in respect to both the medical school and the advanced postgraduate levels of education and training activity was a major consideration.

In 1958, a total of 15,240 licenses to practice medicine were issued by 55 boards authorized by law to grant licenses to practice the art and science of medicine. The 15,240 licenses issued last year represented 7,315 granted after a successful written examination, and 7,925 granted by reciprocity and endorsement of state licenses or the certificate of the National Board of Medical Examiners.

Additions to the medical profession are reflected in a number of tables included in this study. There were, 7,809 physicians who secured their first license to practice medicine and surgery during the calendar year 1958. In the same year, approximately 3,700 deaths of physicians were reported to the offices of the American Medical Association. Thus, the physician population in the United States and its territories and possessions was increased by 4,109.

Failures by graduates of approved medical schools in the United States amounted to 4.3% and by graduates of approved medical schools in Canada 8.3%. The percentage of failures in three other groups—graduates of foreign faculties of medicine, unapproved medical schools, and schools of osteopathy—were 40.9, 76, and 22.2 respectively.

Provision is made by 38 boards for the issuance of temporary and educational permits, limited and temporary licenses, or other certificates of limited registration. The terms for the issuance of these certificates vary and may apply to hospital training, to those ineligible for licensure who seek further educational training, for practice in emergency areas, or for regular practice until the next regular session of the licensing board when permanent licensure is granted. The study further outlines the licensure requirements for interns and residents in hospitals, the states which require an internship for licensure, the preprofessional and professional educational requirements of each licensing board, the schedule of written examination dates and reciprocity meetings, medical license fees, licensure on government credentials, and annual registration requirements.

The Educational Council for Foreign Medical Graduates is referred to briefly in this report and attention is called to the analysis of this evaluation service for foreign medical graduates by Dr. Dean F. Smiley, executive director, which appears elsewhere in this issue.

The Council's study reveals that graduates of foreign medical schools were examined for medical licensure by 43 boards in 1958. Graduates of 231 medical schools and 4 licensing corporations were examined, representing medical schools in the Philippines, New Zealand, 13 South and Central American countries, 26 countries in Europe, and 15 countries in Asia. More than 75 graduates each from the universities of Havana, Munich, Athens, Rome, Mexico, and Geneva were tested in 1958, and more than 20 graduates from 33 other schools were examined. The number who were successful in these tests was 1,518. Failures numbered 1,049, or 40.9% of those examined. Since 1944, there has been a noticeable increase in the number of foreign-trained physicians seeking licensure in the United States. In 1958, the increase over the previous year was 268. During 1958 there were 1,166 foreign-trained physicians licensed who represent additions to the medical profession having secured their first license during the year. Of this group, 1,129 were licensed by written examination and 37 by endorsement of credentials. In an eight-year period, it was shown that 6,483 foreign-trained physicians were added to the physician population of the United States.

That portion of the report pertaining to the results of examinations given by the 22 boards of examiners in the basic sciences reveals that certificates were issued to 6,269 candidates in 1958. Of these, 3,592 were granted after written examination and 2,677 by reciprocity, endorsement, exemption, or waiver. The failure percentage for those reporting this information was 21.9. The basic science laws do not specify that a candidate reveal his school of practice. No attempt has been made in this study to differentiate between the schools and the healing art represented by the candidates examined or certified.

The last series of tabulations refers to the examinations given by the National Board of Medical Examiners. The certificate of the National Board is accepted as a suitable qualification for the practice of medicine by 46 licensing authorities in the states, the District of Columbia, and the territories of the United States. There were 2,011 physicians who were certified as diplomates last year. The largest number of candidates presenting the same type of credential for medical licensure by endorsement last year were 3,215 diplomates certified by the National Board who were licensed in 43 states, the District of Columbia, Hawaii, and Puerto Rico.

This informative study compiled annually by the Council is made available through the cooperation of the various examining and licensing boards; for their cooperation, the Council and THE JOURNAL wish to express appreciation.

ANESTHETIC DANGERS IN HEREDITARY DISEASES

The article in this issue of THE JOURNAL (page 529) by Kritchman, Schwartz, and Papper has drawn attention to the dangers inherent in administering anesthetics to children with familial dysautonomia. Although this condition is relatively uncommon, affected children may require surgery for a variety of reasons. The most outstanding clinical manifestations of familial dysautonomia are related to abnormality of function of the autonomic nervous system. Kritchman and associates described a series of eight patients who received general anesthesia for 27 surgical procedures. Severe hypotension occurred as a complication of anesthesia six times, and cardiac arrest occurred in two patients, requiring open-chest cardiac massage and resuscitation. Bronchopneumonia and atelectasis were frequent postoperative complications. The instances of circulatory collapse were associated with the use of thiopental sodium or tribromoethanol (Avertin). These investigators recommended the use of local anesthesia or a volatile anesthetic agent if surgery is required in patients with famliial dysautonomia.

An increased anesthetic risk also exists in patients with the hepatic type of porphyria. In these patients the condition often remains undiagnosed for many years, and they are often dismissed as "neurotic." Episodes of abdominal pain that may simulate surgical emergencies are common. Dean [1] described 12 patients in 11 family groups in whom the disease was discovered because of reaction to intravenous barbiturate anesthesia. The diagnosis of porphyria was unsuspected prior to operation. Acute episodes of porphyria with paralysis were induced by the anesthetic, and three of the patients died. Porphyria of the hepatic type is conditioned by an autosomal dominant gene, and we therefore expect one parent and half of the sibs and children of any patient with this type of porphyria to possess the gene and to present either clinical or subclinical evidence of the disease. Dean traced the relatives of his 12 original patients and located 216 relatives with evidence of porphyria, and a number of these had experienced acute exacerbations after barbiturate medication.

It seems at least possible that an increased anesthetic risk may also exist in patients with sicklemia, the carrier or heterozygous state of the gene for sickle cell anemia. Cooley and associates [2] described as a clinical triad the association of massive splenic infarction, sicklemia, and high altitude flying. It is well known that the tendency of erythrocytes containing hemoglobin S to assume the characteristic sickle shape is enhanced by lowering of the oxygen tension. Presumably, partial anoxia induces changes in the erythrocytes which predispose to thrombosis and infarction. Accidental hypoxia is at least a risk during general anesthesia, and patients with sicklemia may develop thromboses if the oxygen tension is reduced sufficiently for a sufficiently long period. As approximately 7% of American Negroes have asymptomatic sicklemia, the proportion of surgical patients exposed to this risk is significant. Doenges and associates [3] have suggested that the much smaller group of persons who have both hemoglobin S and hemoglobin C may be more susceptible to the effects of hypoxia than those with hemoglobin S alone.

It is also worthy of note that patients with gout are likely to have acute exacerbations after any operative procedure. Acute attacks of gout may also be precipitated by trauma and ingestion of alcohol and certain drugs including ACTH; it has been suggested that stress producing a syndrome of increased adrenal cortical activity may be the mechanism common to these precipitating factors.[4] It has also been suggested that patients with gargoylism react poorly to anesthetics.

Observations such as these suggest that we should approach problems of anesthesia and chemotherapy in patients with hereditary diseases with some caution. Mutant genes must produce their effects by some alteration of biochemical function. Specific enzyme deficiencies have been found to be associated with specific genotypes in a number of conditions,[5] but the postulated biochemical change in many other hereditary conditions still eludes definition. The person with genetic differences may be inherently different from the majority of the population in his reaction to some type of environmental stimulation. An unusual reaction, or idiosyncrasy, to an anesthetic or other drug may be an expression of a genetically determined inherent difference in the patient so reacting. Such reactions will become predictable and preventable only when sufficient observations such as those mentioned above have accumulated and when the predisposing genetic diseases are regularly identified in specific patients and their families.

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2. Cooley, J. C.; Peterson, W. L.; Engel, C. E.; and Jernigan, J. P.: Clinical Triad of Massive Splenic Infarction, Sicklemia Trait, and High Altitude Flying, J. A. M. A. 154:111-113 (Jan. 9) 1954.

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4. Bauer, W., and Klemperer, F.: Gout, in Diseases of Metabolism: Detailed Methods of Diagnosis and Treatment, edited by G. G. Duncan, ed. 3, Philadelphia, W. B. Saunders Company, 1952.

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MEDICAL LICENSURE STATISTICS FOR 1958

FIFTY-SEVENTH ANNUAL PRESENTATION OF LICENSURE STATISTICS BY THE COUNCIL ON MEDICAL EDUCATION AND HOSPITALS OF THE AMERICAN MEDICAL ASSOCIATION

The data in the following annual report on Medical Licensure Statistics have been compiled by the staff under the supervision of Mrs. Anne Tipner, Assistant to the Secretary of the Council on Medical Education and Hospitals.

Walter S. Wiggins, M.D., Secretary
Council on Medical Education and Hospitals

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INTRODUCTION

Statistical compilations regarding medical licensure are presented annually in the State Board Number of THE JOURNAL. Data are included pertaining to (a) medical examining and licensing boards of the United States, the District of Columbia, and the territories and possessions of the United States, (b) the boards of examiners in the basic sciences, and (c) the National Board of Medical Examiners. The report also contains a résumé of the reevaluation of the medical licensing examination sponsored by the Federation of State Medical Boards of the United States and a summary account of the activities of the Educational Council for Foreign Medical Graduates.

The computations presented are based on official records received throughout the year from all medical examining and licensing agencies of all states, Alaska, the Canal Zone, Guam, Hawaii, Puerto Rico, and the Virgin Islands. Alaska is recognized as a state in these compilations. The figures for Connecticut also include data reported by the homeopathic medical examining board of that state. The only other homeopathic board in operation, in Louisiana, had no new licentiates last year. Data are also included pertaining to the 22 boards of examiners in the basic sciences and, last, the National Board of Medical Examiners. The Council and THE JOURNAL gratefully acknowledge their appreciation to those who have supplied these data as well as other records furnished throughout the year to the American Medical Association.

In the descriptive data, reference is made to the total number of boards for which figures are reported. The figures include the examining and licensing boards in the territories and possessions and also the homeopathic board of Connecticut.

A NEW ERA IN LICENSURE

At the 55th Annual Congress on Medical Education and Licensure, the Federation of State Medical Boards completed the formal sessions devoted to the reevaluation of the medical licensing examinations. In nine separate workshops covering a three-year period, the major areas of concern in the evaluation of fitness by a State Board of Examiners were subjected to a critical analysis of the relation of concern by a board to the state of medical education as it exists today both in respect to the medical school and the advanced postgraduate levels of educational and training activity.

Combined with the examination institutes, the programs of the federation in the past three years have been designed to explore, both from within and from without, the attitudes of licensure in respect to the necessities of change, the shifting of population groups, and the redefining of what fitness means in terms of the greater stability of medical education today. State Boards are aware now that the earlier introduction of clinical experience and the earlier assumption of responsibility for patient care mean a much more concentrated concern over the quality of fitness by the medical schools prior to the time a student graduates than was the case some years ago. There is now a greater

interest in directions and quality in both preprofessional and professional education and a much more definite tendency to be tolerant to experimental programs in education.

There is no opposition in licensure now to the reallocations of time and the pruning procedures needed in the modern medical curriculum. There is, indeed, a growing interest in the federation in the more radical experiments in medical education and a more intelligent interest in what Dean Berry of Harvard College calls "a dynamic and tremendously complex environment."

At the end of the initial series of institutes, one of the most interesting results was the evidence that the primary challenge of reevaluation of the licensing examination is to the examiner and not to the examinee. It is on this evidence that the federation asserts that it is moving into a new era. The number of examiners who attended one or more of the institutes, and the interest they developed in self-improvement, insures that the responsibility of constructing licensing examinations which involve patient problems will increasingly result in better and more practical examinations.

In summing up the experiences of the institutes, the federation recognized that, with frequent changes occurring on Boards of Examiners, there will be a constant need to orient new members to the newer concepts of the realistic purposes of the licensing examination. As a result, there will be an annual examination institute for this purpose. With this objective, there will be opportunity to review, annually, the significant developments of the past year in respect to progress in experimental programs of education and shifts of interest in the total area involved in the education of the physician.

After the completion of the institutes, it was apparent that the decision of the Federation of State Medical Boards to consider that it was moving into a new era was one based upon a much more definite realization that licensure is a vital component of all the interests which are directed toward preserving and improving the quality of medical care in the United States. Thus, the federation accepts the responsibility of being realistic and tolerant in its attitudes as well as the necessity to maintain a constant concern over its policies and procedures.

The federation faces a number of significant problems for future consideration in the field of discipline, the type and construction of examinations best suited to licensure purposes, the problems related to various types of addiction in the licensed groups operating in the health field, and the educational standards involving the increasing number of ancillary groups attached to the periphery of medical practice.

EDUCATIONAL COUNCIL FOR FOREIGN MEDICAL GRADUATES

The Educational Council for Foreign Medical Graduates began operation on Oct. 1, 1957. It has held three examinations to date. Sponsoring agencies are the American Hospital Association, the American Medical Association, the Association of American Medical Colleges, and the Federation of State Medical Boards of the United States. The Board of Trustees of the Educational Council includes representatives from each of these organizations and two members representing the public at large. Its stated purpose is to provide information to foreign medical graduates, to translate and evaluate foreign educational credentials, and to test the foreign medical graduate's command of English and his basic knowledge of medicine. Elsewhere in this issue, Dr. Dean F. Smiley, Executive Director, presents an analysis of the three qualifying examinations thus far held and outlines the plans for future examinations.

MEDICAL LICENSURE STATISTICS

The tables referring to medical licensure present figures pertaining to the number of candidates examined, the number licensed, and the number who represent additions to the physician population. Data are also included pertaining to the regulations for medical licensure both of physicians who secured their professional training in the United States and Canada and of physicians educated in other countries. The state boards are discussed first, followed by the basic science boards and the National Board of Medical Examiners.

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STATE BOARDS OF MEDICAL EXAMINERS

Licenses Issued

In 1958, 15,240 licenses to practice medicine were issued by 55 boards authorized by law to grant licenses to practice the art and science of medicine. The number licensed by each of these boards by examination or by endorsement of credentials is shown in table 1. Of the 15,240 licenses issued, 7,315 were granted after written examination and 7,925 by reciprocity and endorsement of state licenses or the certificate of the National Board of Medical Examiners.

Physicians certified in a given year after written examination were not in all instances tested in that year. Approximately one-half of the boards require a year of internship as a prerequisite for licensure. The candidate for licensure in some states is permitted to write the examination before or while serving an internship and, if he is successful, the license is issued on completion of the internship and dated the year in which issued. Licenses are withheld in some states for other technicalities. In general, also, the licenses of physicians examined in December are dated and issued in the early part of the next year. Table 1, therefore, includes some data on physicians who were examined in 1957 and a few who were examined in previous years. Thus, the figures presented in this table will not correspond with succeeding tables that deal entirely with physicians examined for licensure within the year 1958. In tables 12, 13, and 14 can be noted the number of physicians who secured their first license

in 1958 and who thus represent additions to the medical profession in the United States and its territories and possessions.

Of the 15,136 licenses to practice medicine and surgery issued in 1958, both by examination and by reciprocity and endorsement of credentials, the greatest number (2,305) were issued in California. New York licensed 1,584, while more than 500 each were registered in Illinois, Ohio, Pennsylvania, and Texas. Alaska, Delaware, Idaho, Montana, Nevada, North Dakota, South Dakota, Vermont, and Wyoming issued less than 50 each. Among the territories and possessions, Puerto Rico licensed 107, Hawaii 44, the Canal Zone 6, and Guam and the Virgin Islands 2 each. There was an increase of 104 in the total number of licenses issued in 1958 as compared with the previous year. Candidates licensed by reciprocity and endorsement increased by 439 the number licensed in 1957, while those licensed after written examination showed a decrease of 289.

TABLE 1.—*Licenses Issued, 1958*

	Examination	On Basis of Reciprocity and Endorsement	Total
Alabama	74	74	148
Alaska	5	16	21
Arizona	17	98	115
Arkansas	88	40	128
California	549	1,656	2,205
Canal Zone	..	6	6
Colorado	80	121	201
Connecticut	129	221	350
Delaware	7	19	26
District of Columbia	7	172	179
Florida	461	..	461
Georgia	267	91	358
Guam	..	2	2
Hawaii	29	15	44
Idaho	3	35	38
Illinois	391	173	564
Indiana	179	129	308
Iowa	92	88	180
Kansas	128	34	162
Kentucky	95	99	194
Louisiana	261	121	382
Maine	37	41	78
Maryland	290	190	480
Massachusetts	31	379	410
Michigan	309	169	478
Minnesota	200	102	302
Mississippi	124	32	156
Missouri	266	127	393
Montana	1	34	35
Nebraska	111	30	141
Nevada	3	41	44
New Hampshire	8	44	52
New Jersey	154	340	494
New Mexico	3	52	55
New York	430	1,154	1,584
North Carolina	197	71	268
North Dakota	15	19	34
Ohio	469	345	814
Oklahoma	82	50	132
Oregon	30	77	107
Pennsylvania	517	241	758
Puerto Rico	61	46	107
Rhode Island	45	28	73
South Carolina	59	33	92
South Dakota	10	24	34
Tennessee	146	85	231
Texas	371	237	608
Utah	18	59	77
Vermont	6	36	42
Virginia	245	126	371
Virgin Islands	1	1	2
Washington	60	200	260
West Virginia	20	75	95
Wisconsin	130	141	271
Wyoming	4	26	30
Totals	7,315	7,925	15,240

Tables of the physicians licensed for 23 previous years and for 1958, by both examination and reciprocity or endorsement, are included in table 2. Beginning in 1936, there was a marked increase in the number of physicians licensed representing principally the licensure of foreign-trained physicians. The increases in 1946 and succeeding years were the result of the increase in the production of physicians by the medical schools of the United States and Canada, the licensure of foreign-trained physicians, and in the reciprocity and endorsement group the movement of physicians to other locations for practice. In the 24 years from 1935 to 1958, 282,486 medical licenses have been issued, 153,577 after written examination and 128,909 by endorsement of credentials.

Candidates Examined

In table 3 are recorded data referring to applicants for medical licensure by 53 licensing boards. For each board is given the number who passed and failed, the medical school of graduation, the percentage of failures for each school, as well as each licensing board, and the number of states in which graduates of a given school were examined. Approved medical schools in the United States that are no longer in existence, foreign faculties of medicine, unapproved medical schools, and schools of osteopathy are not listed by name, but the numbers examined in these three categories are included after those for existing medical schools in the United States and Canada.

Throughout the last calendar year 8,633 candidates were examined, of whom 7,268 passed and 1,365 failed. The candidates represented graduates of 78 existing approved medical schools of the United States, 11 approved medical schools of Canada, one approved medical school in the United States no longer in operation, 235 faculties of medicine or licensing corporations of other countries, 5 unapproved medical schools in the United States

TABLE 2.—*Licenses Issued, 1935-1958*

Year	Examination	Reciprocity and Endorsement	Total
1935	5,725	2,194	7,919
1936	6,276	2,773	9,049
1937	6,629	3,295	9,924
1938	6,557	2,956	9,513
1939	6,400	2,872	9,272
1940	6,289	2,866	9,155
1941	6,057	2,762	8,819
1942	6,152	2,469	8,621
1943	6,062	2,340	8,402
1944	7,080	2,596	9,676
1945	5,580	3,622	9,202
1946	6,567	9,669	16,236
1947	6,763	7,701	14,464
1948	5,997	7,595	13,592
1949	5,252	6,929	12,181
1950	5,454	6,755	12,209
1951	5,713	6,225	11,938
1952	6,212	7,016	13,228
1953	6,565	7,869	14,434
1954	6,827	8,202	15,029
1955	7,379	7,461	14,840
1956	7,122	7,421	14,543
1957	7,604	7,486	15,090
1958	7,315	7,925	15,240
Totals	153,577	128,909	282,486

Marginal Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	2
		Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota
	SCHOOL	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F
	ALABAMA																							
1	Medical College of Alabama, Birmingham	68 0									4 3													
	ARKANSAS																							
2	University of Arkansas School of Med., Little Rock				86 1						4 0								1 0					
	CALIFORNIA																							
3	Coll. of Med. Evangelists, Loma Linda, Los Angeles		1 0			60 3	1 0				2 1	2 0									3 0			
4	Univ. of California School of Med., Los Angeles					43 2																		
5	Univ. of So. California School of Med., Los Angeles					42 2																		
6	Stanford University School of Med., San Francisco					38 0					1 0			1 0										
7	Univ. of California School of Med., San Francisco					80 2					1 0													
	COLORADO																							
8	University of Colorado School of Medicine, Denver		2 0				54 0									1 0			2 0			1 1		
	CONNECTICUT																							
9	Yale University School of Medicine, New Haven										4 0			1 0										
	DISTRICT OF COLUMBIA																							
10	Georgetown Univ. School of Med., Washington									1 0	3				1 0				1 0		1 0		1 0	
11	George Washington Univ. School of Med., Wash.					1 0					4 2	2 0		1 0					4 0		3 0			
12	Howard Univ. College of Medicine, Washington					5 1						4 0		1 2	1 0			1 0	1 0		28 0			
	FLORIDA																							
13	University of Miami School of Med., Coral Gables					1 0					32 4	6 0							2 0					
	GEORGIA																							
14	Emory University School of Medicine, Emory Univ.							1 0			21 2	65 0									1 0			
15	Medical College of Georgia, Augusta										13 3	93 0												
	ILLINOIS																							
16	Chicago Medical School, Chicago					1 0					3 0					1 0			1 0					
17	Northwestern University Medical School, Chicago	1 0				13 0					8 2			32 3	6 0		1 0		2 0		1 0 0	1	7 0	
18	Stritch School of Med. of Loyola Univ., Chicago					1 0	1 0				5 4			27 4	3 0				2 0		1 0		3 0	
19	Univ. of Chicago, The School of Medicine, Chicago					6 0		2 0			4 0	1 0		8 0	2 0				1 0			1 0	1 0	
20	University of Illinois College of Medicine, Chicago					13 1	2 0	1 0			8 3			60 3	1 0						1 0 0	1		
	INDIANA																							
21	Indiana University School of Med., Indianapolis		2 0								10 4			5	0 137	2			1 0					
	IOWA																							
22	State Univ. of Iowa College of Medicine, Iowa City		1 0			1 1 1	0				2 0					99 0								
	KANSAS																							
23	Univ. of Kan. School of Med., Lawrence, Kan. City									1 0	1 1			1 0			1 0		1 0					
	KENTUCKY																							
24	University of Louisville School of Med., Louisville										7 3							98 0						
	LOUISIANA																							
25	Louisiana State Univ. School of Med., New Orleans										2 2			1 0					95 0					
26	Tulane University of Louisiana School of Medicine, New Orleans	1 0					1 0				17 2								113 0					
	MARYLAND																							
27	Johns Hopkins Univ. School of Med., Baltimore	1 0				1 1		1 0			3 0	1 0		1 0	1 0					2 0	48 1			
28	University of Maryland School of Medicine and College of Physicians and Surgeons, Baltimore					1 0					6 1			2 0							73 2			
	MASSACHUSETTS																							
29	Boston University School of Medicine, Boston										4 0								1 0	1 0				
30	Harvard Medical School, Boston					2 0	1 0	1 0			6 0	3 0		2 0					2 0	1 0	1 0			
31	Tufts University School of Medicine, Boston										3 4											0 1		
	MICHIGAN																							
32	University of Michigan Medical School, Ann Arbor										12 6			3 0									155 0	
33	Wayne State University College of Med., Detroit										2 0												72 0	
	MINNESOTA																							
34	University of Minnesota Med. School, Minneapolis					2 0					4 0							1 0				2 1		
	MISSISSIPPI																							
35	University of Mississippi School of Med., Jackson										1 0													
	MISSOURI																							
36	University of Missouri School of Med., Columbia										2 0													
37	Saint Louis University School of Med., Saint Louis										7 5			2 0							0 1			
38	Washington University School of Med., Saint Louis						1 0				6 1			2 0										
	NEBRASKA																							
39	Creighton University School of Medicine, Omaha		2 0			3 0	1 0	1 0			1 1			1 0	1 0								1 0	
40	University of Nebraska College of Medicine, Omaha					2 0					4 0							1 0					1 0	
	NEW YORK																							
41	Albany Med. College of Union University, Albany										4 0												1 0	
42	University of Buffalo School of Medicine, Buffalo										7 4												1 0	
43	Columbia University College of Physicians and Surgeons, New York City				1 0	2 0					6 2	2 0							2 0	1 0				
44	Cornell University Medical College, New York City	1 0				1 0					4 0	2 0												
45	New York Medical College, Flower and Fifth Avenue Hospitals, New York City					2 0					7 2				1 0			1 0	4 0	1 0				
	Marginal Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

P—Passed; F—Failed

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24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
Mississippi	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Hawaii, Puerto Rico, and Virgin Islands	Totals	Examined—Passed	Examined—Failed	% Failed	No. of Boards Reciprocity
P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F					
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	95	72	3	4.0	2
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	92	91	1	1.1	3
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	75	71	4	5.3	8
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	67	65	2	4.3	3
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	46	44	2	4.3	3
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	40	40	0	0.0	3
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1 0 1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	61	63	1	1.6	8
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.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	3 0	.. ..	3 1	.. ..	.. ..	2 1	.. ..	.. ..	3 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	24	19	5	20.8	10	1
2 0 1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 1	1 1	0 ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	4 0	.. ..	.. ..	2 1	.. ..	.. ..	.. ..	.. ..	.. ..	24	20	4	16.7	11	1
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	4 4	1 1	.. ..	.. ..	.. ..	.. ..	4 0	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	68	54	14	20.6	13	1
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	2 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	67	63	4	6.0	5	1
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	5 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	96	94	2	2.1	6	1
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	109	106	3	2.8	2	1
3 0	1 1 1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	4 1	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	3 0	.. ..	4 0	.. ..	1 0	.. ..	6	6	0	0.0	4	1
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.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	2 1	.. ..	.. ..	2 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	2 0	3 0	.. ..	.. ..	.. ..	61	51	10	16.4	13	1
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	39	39	0	0.0	18	1
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	142	133	9	6.3	14	2
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	164	158	6	3.7	8	2
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.. 2 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 1 1 0	.. ..	33	31	2	6.1	9	2
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	166	163	3	2.8	2	2
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	100	98	2	2.0	3	2
0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	147	144	3	2.0	8	2
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	2 0	.. ..	.. ..	.. ..	1 0	.. ..	65	63	2	3.1	12	2
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	2 0	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	90	87	3	3.3	8	2
0 1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 1	1 2 0	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	2 0	.. ..	.. ..	0 1	2 1	.. ..	.. ..	.. ..	.. ..	8	8	0	0.0	4	2
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	33	30	3	9.1	17	3
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	8	3	5	62.5	2	3
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	4 0	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	181	175	6	3.3	5	3
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	77	77	0	0.0	2	3
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	130	119	1	0.8	8	3
0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	45	45	0	0.0	2	3
.. 33 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	35	35	0	0.0	2	3
.. 111 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 1	.. ..	.. ..	.. ..	.. ..	.. ..	2 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 1	.. ..	.. ..	.. ..	1 0	.. ..	129	124	5	3.9	8	3
.. 86 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	6 1	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	2 0	.. ..	106	104	2	1.9	7	3
.. 1 0	.. 34 0	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	1 0	.. ..	1 0	.. ..	0 1	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	2 1	.. ..	.. ..	1 0	.. ..	60	57	3	5.0	18	3
.. ..	.. 74 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	81	81	0	0.0	7	4
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	5	5	0	0.0	2	4
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	13	9	4	30.8	3	4
.. ..	.. ..	.. ..	.. ..	.. ..	1 0	1 0	.. ..	5 2	4 0	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	2 0	.. ..	.. ..	.. ..	1 1	.. ..	1 0	.. ..	.. ..	36	31	5	13.9	15	4
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	5 0	2 0	.. ..	1 1	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	21	20	1	4.8	11	4
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	0 1	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23	20	3	13.1	11	4
4	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56

Marginal Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Marginal Number	SCHOOL	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota
		P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P
	NEW YORK—continued																							
56	New York University Coll. of Med., New York City							0 1			12	0 1	0		1 0					1 0				
57	State University of New York, Downstate Medical Center, New York City					1 0			1 0		10	2 1	0		2 0				1 0					
58	Univ. of Rochester School of Med. and Dentistry					1 0				1 0	1 1							1 0	1 0					1
59	State University of New York, Upstate Medical Center, Syracuse					1 0					4 1	1 0							2 0					
	NORTH CAROLINA																							
60	University of North Carolina School of Medicine, Chapel Hill											1 0							1 0					
61	Duke University School of Medicine, Durham	1 0				1 0					13 2	2 0							1 0		1 0			
62	Bowman Gray School of Medicine of Wake Forest College, Winston-Salem										7 3			2 1										
	OHIO																							
63	Univ. of Cincinnati College of Medicine, Cincinnati					1 0	1 0				5 2			1 0										
64	Western Reserve Univ. School of Med., Cleveland										4 1			1 0					1 0					
65	Ohio State University College of Med., Columbus										8 2								1 0					1
	OKLAHOMA																							
66	Univ. of Oklahoma School of Med., Oklahoma City					1 0		1 0			2 1			0 1					2 0					
	OREGON																							
67	University of Oregon Medical School, Portland	2 0				5 0		1 0						1 0		1 0			1 0					2
	PENNSYLVANIA																							
68	Hahnemann Medical Coll. and Hosp. of Philadelphia					5 0					10 2			1 0				1 0			0 1			
69	Jefferson Med. Coll. of Philadelphia, Philadelphia					1 0	1 0	1 0	2 0		7 1										4 0			2
70	Temple University School of Medicine, Philadelphia	1 0				4 0			1 0		16 3			1 0	1 0				1 0		1 0			
71	Univ. of Pennsylvania School of Med., Philadelphia					3 0	1 0	1 0			9 0			2 0					1 0					
72	Woman's Med. Coll. of Pennsylvania, Philadelphia					2 1					1 1			1 0									1 0	
73	Univ. of Pittsburgh School of Med., Pittsburgh					4 0					8 0	1 0		2 0							1 0			
	PUERTO RICO																							
74	Univ. of Puerto Rico School of Med., San Juan					1 0						1 0							1 0					
	SOUTH CAROLINA																							
75	Medical College of South Carolina, Charleston	1 0									4 0			2 1										
	TENNESSEE																							
76	University of Tennessee College of Med., Memphis					1 0					21 6	2 0		1 0				2 0						
77	Meharry Medical College, Nashville	1 0				4 0		1 0			1 0	2 0		2 1				1 0			2 2		2 0	
78	Vanderbilt University School of Medicine, Nashville					1 0					11 1										1 0			1
	TEXAS																							
79	Univ. of Texas Southwestern Med. School, Dallas	1 0	1 0																1 0					
80	University of Texas Medical Branch, Galveston	1 0																						
81	Baylor University College of Medicine, Houston																1 0		1 0					
	UTAH																							
82	University of Utah School of Med., Salt Lake City	1 0			22	0						2 0		1 0		1 0						3 0	1 0	2
	VERMONT																							
83	University of Vermont College of Med., Burlington										2 2													
	VIRGINIA																							
84	Univ. of Virginia School of Med., Charlottesville										2 1	1 0												
85	Medical College of Virginia, Richmond										8 0			1 0	1 0				2 0		1 0			
	WASHINGTON																							
86	University of Washington School of Med., Seattle					6 0				2 0		1 0		2 0					2 0					
	WISCONSIN																							
87	University of Wisconsin Medical School, Madison					6 1								1 0	1 0				1 0				1 0	
88	Marquette University School of Med., Milwaukee	1 0				7 1	4 0				2 1			7 1					1 0		1 0			
	CANADA																							
89	Univ. of Alberta Faculty of Medicine, Edmonton					8 0								1 0	3 0								1 0	
90	Univ. of British Columbia, Sch. of Med., Vancouver																							
91	University of Manitoba Faculty of Med., Winnipeg					7 0													1 0		1 0		1 0	
92	Dalhousie University Faculty of Medicine, Halifax					3 0		2 0												1 0				
93	Queen's University Faculty of Medicine, Kingston					2 0		1 1			1 1								1 0				1 0	
94	Univ. of Western Ontario Faculty of Med., London	0 1				1 0		1 0			2 1												3 0	
95	University of Ottawa Faculty of Medicine, Ottawa					0 1														1 0	1 0	1 0		
96	University of Toronto Faculty of Med., Toronto					3 0					2 0			1 0	1 0						2 0		1 0	
97	McGill University Faculty of Medicine, Montreal					6 0		1 0			2 0			1 0						1 0	1 0	1 0	1 0	
98	University of Montreal Faculty of Med., Montreal					2 0																		
99	Laval University Faculty of Medicine, Quebec					3 0														1 2				
100	Univ. of Saskatchewan College of Med., Saskatoon					2 0																		
	OTHERS																							
101	Foreign Medical Faculties	2 0	1 0	3 0		98 65	1 0	13 5	8 3	2 15	0 14	14 8	0	109 278	8 1	2 0	1 0		1 0	26 9	114 66	21 36	31 0	1
102	Extinct Approved Medical School											1 0												
103	Unapproved Medical Schools										1 2			0 1								1 13		
104	Schools of Osteopathy									1 0				6 4	6 0		16 0					0 1		
105	Totals	74 5	18	80	612	75	213	9	21	575	254	2	679	182	104	21	104	261	48	371	86	287		
106	Totals Examined—Passed	74 5	17	88	530	75	153	7	21	461	254	2	379	179	104	21	104	261	37	292	31	287		
107	Totals Examined—Failed	0 0	1	1	82	0	60	2	0	114	0	0	300	3	0	0	0	0	11	79	55	0		
108	Percentage Failed	0.0 0.0	5.6	1.1	13.4	0.0	28.2	22.2	0.0	19.8	0.0	0.0	44.2	1.6	0.0	0.0	0.0	0.0	22.9	21.3	64.0	0.0		
	Marginal Number	1 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		

P—Passed; F—Failed

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	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Hawaii, Puerto Rico, and Virgin Islands	Totals	Examined—Passed	Examined—Failed	% Failed	No. of Boards Examined by Marginal Number
F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F					
						1 0		3 2											2 0									24	21	3	12.5	8 46
								1 0	1 0										2 0									22	20	2	9.1	9 47
								3 0	3 0					1 0					1 0									18	17	1	5.6	10 48
																												9	8	1	11.1	4 49
									56 3					1 0														62	59	3	4.8	4 50
0								1	0 0 3							1 0			1 0									57	52	5	8.2	11 51
									42 5	1 0																		61	52	9	14.8	4 52
								0	1		75 0																	86	83	3	3.5	6 53
								4	1		71 1																3 0	87	84	3	3.5	6 54
								4	1		129 0																1 0	157	154	3	1.9	6 55
	1 0							2	0			72 0		1 0														84	82	2	2.4	9 56
							1 0			1 0			24 0	2 0											1 0		1 0	45	43	0	0.0	13 57
		1 0			1 0	12 0		1	1		2 0			65 0						2 0	1 0				2 0			108	104	4	3.7	14 58
						9 0		2	0		6 0			130 0											1 0			167	166	1	0.6	12 59
0						3 0		2	1 2 0		2 0			85 0			1 0				1 0		1 0	2 0			130	126	4	3.1	18 60
						1 0		4	1 3 0		2 0			58 0												1 0	87	86	1	1.1	10 61
						2 0					4 0			18 0					2 0									33	31	2	6.1	8 62
											1 0			79 0			2 0		1 0									99	99	0	0.0	9 63
								4	2																		1 0	10	8	2	20.0	5 64
								1	0							37 0												66	65	1	1.5	5 65
0								1	0 2 0	1 0								101 0										191	185	6	3.1	10 66
0	7 0					1 0		3	0		1 1					1 0												94	84	10	10.6	15 67
0								1	0	1 0				1 0				41 0						1 0		0 1		82	80	2	3.3	11 68
		1 0							1 0										85 2									92	90	2	2.2	6 69
																			146 1									148	147	1	0.7	2 70
								1	0					1 0					74 1									79	78	1	1.3	5 71
	1 0 1 0										1 0			1 0					1 0 16 0				2 0			1 0 2 0		59	59	0	0.0	17 72
														1 0							4 0				1 0			10	8	2	20.0	4 73
								1	1													65 4						75	69	6	8.0	4 74
						1 0			1 0					2 0								77 11		10 0				115	104	11	9.6	10 75
	1 0												1 0					1 0		1 0		31 11			1 0 1 0			70	59	11	15.7	13 76
	1 0							1	0		1 0			3 0										1 0		50 0		77	76	1	1.3	11 77
	1 0					1 0		1	1				1 0						1 0							55 0		94	90	4	4.3	14 78
														1 0									0 1					19	18	1	5.3	7 79
														0														0	0	0	0.0	0 80
	1 0			2 0	1 0					3 1	1 0		1 0	2 0														28	27	1	3.6	12 81
									2 0					2 0					1 0									13	13	0	0.0	7 82
									1 0					1 0											2 0			14	12	2	14.3	10 83
					1 0			0	1 1 0		3 0			2 1														18	14	4	22.2	10 84
								1	0		1 0								1 0						1 0			9	8	1	11.1	9 85
	1 0							2	1 0 1		1 0			3 0					1 0			1 0				1 0		26	24	2	7.7	16 86
					1 0			1	0		1 0			2 0 1 0								1 0 0 1		1 0				26	25	1	3.8	17 87
					1 0			1	0																			5	5	0	0.0	4 88
								1	0																			8	6	2	25.0	4 89
																												2	2	0	0.0	1 90
	2 3		1 0	1 0	1 0	111 24	2 0	352 382	1 4	1 1	71 95		1 0	35 0	42 1		1 0		35 10			95 94	12 6	4 0	14 1	1 0	71 19	2,967	1,518	1,049	40.5	42 91
								2	3					2 0														25	6	19	76.0	5 93
					1 0	2 0		35	19		66 15								5 1						2 0			180	140	40	22.2	11 94
	280	4	111	3	8	178	3	802	214	17	579	72	31	518	46	59	5	146	387	18	7	357	83	20	155	5	111	8,033			15.8	95
	276	4	111	3	8	154	3	484	197	15	464	72	30	317	45	59	5	146	372	18	7	345	60	20	153	4	90		7,308			96
	4	0	0	0	0	24	0	318	17	2	115	0	1	1	1	0	0	0	15	0	0	112	23	0	2	1	21			1,265		97
	14	0.0	0.0	0.0	0.0	13.5	0.0	39.7	7.9	11.8	19.9	0.0	3.2	0.2	2.2	0.0	0.0	0.0	3.9	0.0	0.0	31.4	27.7	0.0	1.3	20.0	18.9				15.8	98
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56

that are no longer in operation, and 8 schools of osteopaths. Osteopaths who were granted the legal right to practice medicine, surgery, or both, by the medical examining boards, are included in these statistics. Osteopaths in other states who were granted the privilege of special practice by other than medical examining boards are excluded from these compilations.

Examination and reciprocity meetings are scheduled at frequent intervals by licensing boards in most of the states to facilitate licensure and to enable physicians to commence practice without undue delay. Later in this study a tabulation is included giving the schedules for all states. The publication of the dates for examinations and reciprocity or endorsement meetings is a regular biweekly feature of THE JOURNAL.

Represented among the 8,633 examinees were 5,692 graduates of approved medical schools in the United States, of whom 4.3% failed; 168 graduates of approved schools in Canada with 8.3% failures; 1 graduate from an approved medical school no longer in operation who passed; 2,567 graduates of faculties located in countries other than the United States and Canada, 40.9% of whom failed; 25 graduates of unapproved medical schools at one time in existence in the United States, with 76.0% failures; and 180 graduates of schools of osteopathy with 22.2% failures.

As in table 1, the 8,633 examinees do not represent an equal number of persons, since a candidate tested in more than one state in a calendar year is counted in each state. If a candidate failed more than once in a given state within the year, however, he is counted in that state as an individual or a single failure. Figures that show the number of individual licentiates added to the medical profession in 1958 are given in tables 11, 12, and 13.

The University of Tennessee, a state university, had the greatest number of graduates for any one school examined for medical licensure in 1958. There were 191 graduates examined, of whom 104 were tested in Tennessee and 87 in nine other states. The greatest number examined from a private school was 167 representing Jefferson Medical College; they were tested in 12 states, with 130 being tested in Tennessee. Eleven public and eight private medical schools each had more than 100 of their graduates examined for medical licensure in 1958, as follows:

Public Medical Schools	No. of Examinees	No. of States in Which Examinations Were Taken
Medical College of Georgia	109	2
University of Illinois	142	14
Indiana University	164	8
State University of Iowa	109	8
Louisiana State University	100	3
University of Michigan	181	5
University of Minnesota	120	8
Ohio State University	157	6
University of Tennessee	191	10
University of Texas	148	2
Medical College of Virginia	115	10

Private Medical Schools	No. of Examinees	No. of States in Which Examinations Were Taken
Northwestern University	104	20
University of Louisville	106	2
Tulane University	147	8
St. Louis University	129	8
Washington University	106	7
Hahnemann, Philadelphia	108	14
Jefferson Medical College	167	12
Temple University	130	18

The Albany Medical College, with five examinees, had the fewest applicants for medical licensure by written examination before state boards. Five other medical schools were represented with fewer than 10 graduates—Yale, Chicago Medical, Boston, Tufts, and Syracuse. The majority of the graduates of these schools are licensed by endorsement of the certificate of the National Board of Medical Examiners.

There were 168 graduates of 11 of the approved medical schools in Canada tested for medical licensure in 1958 in 27 states and Hawaii. The figures are given for each licensing board by school in table 3 and the numbers examined in each state in table 4. Of the 168 candidates examined, 154 passed and 14, or 8.3%, failed. The University of British Columbia, an approved medical school, had no graduates appearing before state boards. The University of Saskatchewan graduated its first class of students in 1957, but none appeared for licensure in the United States in that year. In 1958, however, there were two examined and both passed.

One graduate of Rush Medical College, an approved school no longer in operation, was examined in Georgia, and passed. All other graduates of approved medical schools represented in table 3 were from existing institutions. Graduates of five unapproved medical schools were examined in five states. The schools represented in this group are no longer in operation in the United States. There were 25 examinees in this category, of whom 6 passed and 19, 76%, failed. Of 180 graduates of eight osteopathic schools examined in 11 states, 140 passed and 40, 22.2%, failed. Graduates of 235 foreign faculties of medicine were examined by 42 states. There were 2,567 such graduates, with 1,518 successful examinations, and 1,049, or 40.9%, failures.

Totals for the six categories are given in table 5. It will be noted that 4.3% of the graduates of existing approved medical schools in the United States and 8.3% of the graduates of approved Canadian schools failed. The greatest number of failures fell within three groups: foreign faculties of medicine, unapproved medical schools, and schools of osteopathy. Those in these three groups registered by medical boards are separately discussed in later tables.

Consolidated Results of Examinations

The combined results of two groups of examinations, the state medical board examinations and part 3 of the examinations of the National Board of

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Medical Examiners, are given in table 6. This table represents a comprehensive analysis of the performance of physicians from individual schools. It will be noted that in some instances schools having failures before state licensing boards had few, if any, failures before the National Board.

In 1958 there were 5,692 graduates of approved medical schools in the United States examined by state boards and of whom 4.3% (243) failed. In the same calendar year 1,951 graduates of these schools were tested in the final examination of the National Board and 12 failed. In both groups, a total of 7,643 were examined, of whom 7,388 passed and 255, or 3.3%, failed.

Of the graduates of Canadian medical schools, 8.3% failed state board examinations while there were no failures among the 63 graduates who were tested by the National Board. Only 9 graduates of foreign medical schools were examined by the

TABLE 4.—*Graduates of Medical Schools in Canada Examined for Licensure in the United States, 1958*

	Examined	Passed	Failed
Arizona	1	0	1
California	38	37	1
Connecticut	6	5	1
Florida	9	7	2
Hawaii	1	1	0
Illinois	3	3	0
Indiana	4	4	0
Louisiana	2	2	0
Maine	6	4	2
Maryland	5	5	0
Massachusetts	2	2	0
Michigan	8	8	0
Minnesota	22	22	0
Mississippi	2	2	0
Missouri	2	2	0
Nevada	2	2	0
New Hampshire	4	4	0
New York	8	6	2
North Carolina	5	4	1
North Dakota	4	3	1
Ohio	7	7	0
Oregon	1	1	0
Pennsylvania	14	13	1
Rhode Island	1	1	0
Texas	3	3	0
Virginia	3	2	1
Washington	1	0	1
Wisconsin	4	4	0
Totals	168	154	14

National Board, and 2,567 were examined by state boards. One graduate of an approved medical school no longer in existence was examined by a state board, and the National Board also had one such graduate who was certified. There were none examined by the National Board in the approved medical school or osteopathic categories. There is no comparison to be made in the three groups last mentioned.

The total of all candidates examined by state boards was 8,633, of whom 7,268 passed and 1,365, 15.8%, failed. For both groups, state boards and the National Board, there were a total of 10,656 examined, with 9,279 successful candidates, and 1,377 failures, or 12.9%. Including the National Board figures reduces the over-all percentage of failures by about 3%.

Failures in Medical Licensure Examinations

Licensure failures in 1958 before state medical licensing boards are further analyzed in table 7. In this tabulation is given the number examined in each state, the number who passed and failed, and the percentage of failures.

The following 12 approved schools in the United States had no failures among their graduates in medical licensing examinations last year:

	Number of Graduates Examined	No. of States in which Examinations Were Taken
Stanford University	40	3
Chicago Medical School	6	4
University of Chicago	39	18
Boston University	8	4
Wayne State University	77	2
University of Mississippi	45	2
University of Missouri	35	2
University of Nebraska	84	7
Albany Medical College	5	2
University of Oregon	43	13
University of Pittsburgh	99	9
University of Utah	59	17

It will be noted, referring to table 3, that those states with high percentages of failures examine a considerable number of foreign-trained physicians. The one exception is Florida. This state has no provisions for medical licensure by reciprocal or endorsement registration, and physicians planning semiretirement in a more ideal climate seek licensure in this state. Many of these physicians graduated from medical schools in the early years of the century and experience difficulty in writing examinations.

In general, state licensing boards require the applicant to receive an over-all average of 75%, and at least 60% in any one subject in the written examination in order to qualify for registration. In case

TABLE 5.—*Source of Candidates Examined for Licensure in the United States, 1958*

Medical Schools	No. of Schools	No. Examined	No. Passed	No. Failed	% Failed
Approved schools [1] in United States	78	5,692	5,449	243	4.3
Approved in Canada	11	168	154	14	8.3
Extinct	1	1	1	0	0.0
Foreign	235	2,567	1,518	1,049	40.9
Unapproved schools	5	25	6	19	76.0
Schools of osteopathy	8	180	140	40	22.2
Totals		8,633	7,268	1,365	15.8

of failure in not more than two subjects, in some states the applicant is permitted a second examination within 12 months. A few states consider such persons as conditioned in the subjects in which they fail. Conditioned candidates are not counted as failures in these statistics. When their grades are raised after a successful examination, they are recorded among those who passed.

Of the 15,240 persons obtaining licenses in 1958, 258 failed state board tests before obtaining a license. Of these, 124 had one failure, 59 had two failures, 32 had three failures, and 43 had four or

TABLE 6.—*Combined Results of Examinations of State Boards and the National Board of Medical Examiners, 1958*

School	Results by Medical Examining Board Tests		Part 3 Examination of National Board of Medical Examiners		Total Examined	Totals		% Failed
	P	F	P	F		P	F	
Medical College of Alabama	72	3	2	..	77	74	3	3.9
University of Arkansas	91	1	3	..	95	94	1	1.1
College of Medical Evangelists	71	4	39	..	114	110	4	3.5
University of California, Los Angeles	45	2	1	..	48	46	2	4.2
University of Southern California	44	2	1	..	47	45	2	4.2
Stanford University	40	0	21	..	61	61	0	0.0
University of California, San Francisco	82	3	1	..	86	83	3	3.5
University of Colorado	63	1	3	..	67	66	1	1.5
Yale University	9	1	75	..	85	84	1	1.2
Georgetown University	19	5	81	1	106	100	6	5.7
George Washington University	24	4	78	..	106	102	4	3.8
Howard University	54	14	5	..	73	59	14	19.2
University of Miami	63	4	12	..	79	75	4	5.3
Emory University	94	2	2	..	98	96	2	2.0
Medical College of Georgia	106	3	0	..	109	106	3	2.8
Chicago Medical School	6	0	66	2	74	72	2	2.8
Northwestern University	96	8	56	..	160	152	8	5.0
Stritch School of Medicine	51	10	43	2	106	94	12	11.3
University of Chicago	39	0	45	..	84	84	0	0.0
University of Illinois	133	9	18	..	160	151	9	5.6
Indiana University	158	6	0	..	164	158	6	3.7
State University of Iowa	108	1	3	..	112	111	1	0.9
University of Kansas	31	2	15	..	48	46	2	4.2
University of Louisville	103	3	8	..	114	111	3	2.6
Louisiana State University	98	2	0	..	100	98	2	2.0
Tulane University	144	3	2	..	149	146	3	2.0
Johns Hopkins University	63	2	8	..	73	71	2	2.7
University of Maryland	87	3	4	..	94	91	3	3.2
Boston University	8	0	68	..	76	76	0	0.0
Harvard Medical School	30	3	111	1	145	141	4	2.8
Tufts College Medical School	3	5	115	1	124	118	6	4.8
University of Michigan	175	6	4	..	185	179	6	3.2
Wayne University	77	0	1	..	78	78	0	0.0
University of Minnesota	119	1	1	..	121	120	1	0.8
University of Mississippi	45	0	0	..	45	45	0	0.0
University of Missouri	35	0	3	..	38	38	0	0.0
St. Louis University	124	5	8	..	137	132	5	3.6
Washington University	101	2	10	1	117	114	3	2.6
Creighton University	57	3	27	..	87	84	3	3.4
University of Nebraska	84	3	3	1	91	87	1	1.1
Albany Medical College	5	0	49	..	54	54	0	0.0
University of Buffalo	9	4	66	1	80	75	5	6.3
Columbia University	31	5	107	..	143	138	5	3.5
Cornell University	20	1	76	..	97	96	1	1.0
New York Medical College	20	3	98	..	121	118	3	2.5
New York University	21	3	113	..	137	134	3	2.2
State University of New York, New York	39	2	145	1	188	185	3	1.8
University of Rochester	17	1	58	..	76	75	1	1.3
State University of New York, Syracuse	8	1	60	..	69	68	1	1.4
University of North Carolina	59	3	0	..	62	59	3	4.8
Duke University	92	5	7	..	104	99	5	4.8
Bowman-Gray School of Medicine	32	9	0	..	41	32	9	21.8
University of Cincinnati	83	3	0	..	86	83	3	3.5
Western Reserve University	84	3	41	..	128	125	3	2.3
Ohio State University	154	3	1	..	158	155	3	1.9
University of Oklahoma	82	2	0	..	84	82	2	2.3
University of Oregon	43	0	17	..	60	60	0	0.0
Hahnemann Medical College	104	4	9	..	117	113	4	3.4
Jefferson Medical College	160	1	11	..	178	177	1	0.6
Temple University	128	4	8	..	140	134	4	2.9
University of Pennsylvania	86	1	33	..	120	119	1	0.8
Woman's Medical College	31	2	18	..	51	49	2	3.9
University of Pittsburgh	99	0	2	..	101	101	0	0.0
University of Puerto Rico	8	2	29	..	39	31	2	6.1
Medical College of South Carolina	65	1	0	..	66	65	1	1.5
University of Tennessee	185	6	1	..	192	186	6	3.1
Meharry Medical College	84	10	0	..	94	84	10	10.6
Vanderbilt University	69	2	3	..	74	72	2	2.7
Southwestern Medical School	90	2	0	..	92	90	2	2.2
University of Texas	147	1	1	..	149	148	1	0.7
Baylor University	78	1	0	..	79	78	1	1.3
University of Utah	59	0	1	1	61	60	1	1.6
University of Vermont	8	2	30	..	40	38	2	5.0
University of Virginia	69	6	0	..	75	69	6	8.0
Medical College of Virginia	104	11	4	..	119	108	11	9.2
University of Washington	59	11	6	..	76	65	11	14.5
University of Wisconsin	76	1	2	..	79	78	1	1.3
Marquette University	90	4	6	..	100	96	4	4.0
Subtotals: U. S. Schools	5,449	233	1,939	12	7,643	7,388	255	3.3
University of Alberta	18	1	1	..	20	19	1	5.0
University of British Columbia	0	0	2	..	2	2	0	0.0
University of Manitoba	27	1	3	..	31	30	1	3.2
Dalhousie University	13	0	1	..	14	14	0	0.0
Queen's University	12	2	3	..	17	15	2	11.8
University of Western Ontario	14	1	2	..	20	16	4	20.0
University of Ottawa	8	1	9	..	18	17	1	5.6
University of Toronto	24	2	2	..	28	26	2	7.1
McGill University	55	1	40	..	96	95	1	1.5
University of Montreal	5	0	0	..	5	5	0	0.0
Laval University	6	2	0	..	8	6	2	25.0
University of Saskatchewan	2	0	0	..	2	2	0	0.0
Subtotals: Canadian Schools	154	14	63	..	231	217	14	2.3
Foreign Medical Faculties	1,518	1,049	8	..	2,575	1,526	1,049	40.7
Extinct approved Medical School	1	0	1	..	2	2	0	0.0
Unapproved Medical Schools	6	19	0	..	25	6	19	76.0
Osteopathic Schools	140	40	0	..	180	140	40	28.6
Subtotals Others	1,665	1,108	9	..	2,782	1,674	1,108	27.9
Totals	7,268	1,355	2,011	12	10,656	9,279	1,377	12.9

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more failures. Twenty-seven physicians failed from 5 to 10 tests before securing licenses. One physician failed 12 tests and another failed 19 tests before achieving success; both of these were foreign-trained individuals. Of all physicians licensed after one or more failures, 258 were foreign-trained and 17 were graduates of medical schools in the United States.

Registration by Reciprocity and Endorsement

A summary of the reciprocity and endorsement policies pertaining to medical licensure is included in table 8. One state, Florida, requires all applicants for medical licensure to pass a written examination. Hawaii and the Virgin Islands do not have reciprocal relations with any state, but Hawaii will endorse physicians certified by the National Board of Medical Examiners. Twenty-two boards require applicants for licensure to obtain a certificate from the board of examiners in the basic sciences of the state. In the section of this report pertaining to basic science boards is included a table outlining the reciprocity, endorsement, exemption, or waiver policies of the basic science boards.

Twenty-nine states, Alaska, and Puerto Rico have reciprocal agreements with specific states. In 19 states, the Canal Zone, and Guam, reciprocity is extended at the discretion of the licensing board. Twenty states, which have reciprocal agreements, also have similar discretionary powers to endorse applicants from nonreciprocating states who present credentials that correspond with those required by their respective states in the year issued. Also in this table is a column indicating the recognition accorded the certificate of the National Board of Medical Examiners.

Additional requirements, including professional practice, citizenship, oral examination, internship, and the fee for a license by reciprocity or endorsement are also recorded. In some states, physicians of Canadian birth are exempted from the citizenship requirement. This is indicated by footnote and is also represented in a later table pertaining to the acceptance of Canadian credentials. Few states will accept graduates of foreign faculties of medicine on a reciprocal basis. Again, details of the requirements of each state for foreign-trained physicians will be found later in this report. Other requirements or exemptions are indicated by footnotes; footnote numbers are referred to in the column headed "Miscellaneous."

This chart is intended to present an over-all picture of the reciprocity and endorsement policies of the licensing boards. It is helpful to physicians who are considering a change in location. The facts recorded, however, are intended to present merely statements of licensure policies. The information here given should be supplemented by direct communication with the licensing boards. A list of the executive officers in charge of medical licensure appears elsewhere in this report.

The procedure in issuing licenses by reciprocity or endorsement varies. Some states consider applications for licensure at any time, while others hold monthly, quarterly, or semiannual meetings. The policy in effect in each state is presented in a later table. In addition, THE JOURNAL publishes biweekly the exact dates when applications are considered.

In table 9 are presented data pertaining to the credentials accepted as the basis for licenses granted without written examination in 1958. There were 7,925 so registered on the basis of licenses

TABLE 7.—*Failures in Medical Licensure Examinations, 1958*

State in Which Examined	No. Examined	No. Passed	No. Failed	% Failures
Alabama	74	74	0	0.0
Alaska	5	5	0	0.0
Arizona	18	17	1	5.6
Arkansas	89	88	1	1.1
California	612	530	82	13.4
Colorado	75	75	0	0.0
Connecticut	213	153	60	28.2
Delaware	9	7	2	22.2
District of Columbia	21	21	0	0.0
Florida	575	461	114	19.8
Georgia	254	254	0	0.0
Hawaii	36	29	7	19.4
Idaho	2	2	0	0.0
Illinois	679	379	300	44.2
Indiana	182	179	3	1.6
Iowa	104	104	0	0.0
Kansas	21	21	0	0.0
Kentucky	104	104	0	0.0
Louisiana	261	261	0	0.0
Maine	48	37	11	22.9
Maryland	371	292	79	21.3
Massachusetts	86	31	55	64.0
Michigan	287	287	0	0.0
Minnesota	200	200	0	0.0
Mississippi	124	124	0	0.0
Missouri	280	276	4	1.4
Montana	4	4	0	0.0
Nebraska	111	111	0	0.0
Nevada	3	3	0	0.0
New Hampshire	8	8	0	0.0
New Jersey	178	154	24	13.5
New Mexico	3	3	0	0.0
New York	802	484	318	39.7
North Carolina	214	197	17	7.9
North Dakota	17	15	2	11.8
Ohio	575	460	115	19.9
Oklahoma	72	72	0	0.0
Oregon	31	30	1	3.2
Pennsylvania	518	517	1	0.2
Puerto Rico	74	60	14	18.9
Rhode Island	46	45	1	2.2
South Carolina	59	59	0	0.0
South Dakota	5	5	0	0.0
Tennessee	146	146	0	0.0
Texas	387	372	15	3.9
Utah	18	18	0	0.0
Vermont	7	7	0	0.0
Virgin Islands	1	1	0	0.0
Virginia	357	245	112	31.4
Washington	83	60	23	27.7
West Virginia	30	30	0	0.0
Wisconsin	155	153	2	1.3
Wyoming	5	4	1	20.0
Totals	8,633	7,308	1,365	15.8

issued by other states, the certificate of the National Board of Medical Examiners, by special exemption, and by acceptance of service with an agency of the government of the United States. California issued the greatest number of licenses by this method. In this state, 1,656 were registered. New York licensed 1,154. Eight other states licensed more than 200—Connecticut 221, Massachusetts 379, New Jersey 340, Ohio 345, Pennsylvania 241, Texas 237, and Washington 200.

TABLE 8.—*Reciprocity and Endorsement*

Marginal Number	The Examining Board of	Reciprocates with, or Endorses Certificates Granted by: Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	Dist. of Columbia	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	Marginal Number
1	Alabama	+	..	+	..	..	..	..	+	..	..	..	..	..	..	+	+	..	..	..	+	+	+	+	..	..	+	+	+	..	1
2	Alaska	+	..	+	+	+	+	..	+	..	..	..	..	..	..	+	+	..	..	..	+	+	+	+	..	..	+	+	+	..	2
3	Arizona	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
4	Arkansas	+	+	..	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	4
5	California	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5
6	Canal Zone	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6
7	Colorado	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7
8	Connecticut	..	..	..	..	..	..	..	+	..	..	..	+	+	..	+	+	..	+	+	+	..	..	..	..	..	..	..	..	+	..	..	8
9	Delaware	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9
10	District of Columbia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10
11	Florida	No reciprocity or endorsement policies																													11
12	Georgia	+	..	+	+	..	..	+	..	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	12
13	Guam	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13
14	Hawaii	No reciprocal relations																													14
15	Idaho	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15
16	Illinois	+	..	+	+	+	..	..	..	..	+	..	+	+	+	+	+	..	+	..	+	+	+	+	+	+	..	+	+	..	..	16
17	Indiana	..	..	..	..	..	..	..	..	..	..	..	..	+	+	+	+	..	+	..	+	+	+	+	+	+	..	+	+	..	..	17
18	Iowa	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+	+	..	+	..	+	+	+	+	+	+	..	+	+	..	..	18
19	Kansas	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+	..	+	..	+	+	+	+	+	+	..	+	+	..	..	19
20	Kentucky	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	..	+	..	+	+	+	+	+	+	..	+	+	..	..	20
21	Louisiana	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
22	Maine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+	+	+	+	+	+	+	+	..	+	+	..	..	22
23	Maryland	+	..	+	+	..	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	23
24	Massachusetts	+	..	..	..	..	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	24
25	Michigan	+	+	..	..	..	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	25
26	Minnesota	+	+	11	+	+	+	+	..	+	+	+	13	+	13	+	13	13	+	+	+	+	+	+	+	+	..	+	+	11	+	26
27	Mississippi	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	27
28	Missouri	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	..	+	+	+	+	28
29	Montana	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	29
30	Nebraska	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	30
31	Nevada	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	31
32	New Hampshire	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	32
33	New Jersey	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	33
34	New Mexico	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	34
35	New York	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	35
36	North Carolina	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	36
37	North Dakota	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	37
38	Ohio	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	38
39	Oklahoma	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	39
40	Oregon	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	40
41	Pennsylvania	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	41
42	Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	42
43	Rhode Island	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	43
44	South Carolina	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	44
45	South Dakota	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	45
46	Tennessee	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	46
47	Texas	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	47
48	Utah	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	48
49	Vermont	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	49
50	Virginia	+	+	+	+	+	+	+	19	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	50
51	Virgin Islands	No reciprocal relations																													51
52	Washington	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	52
53	West Virginia	+	..	+	20	20	+	+	..	+	..	+	20	20	20	20	+	+	+	20	+	+	+	+	+	+	..	+	+	+	+	53
54	Wisconsin	+	+	+	+	+	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	..	+	+	+	+	54
55	Wyoming	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	55

This summary should be supplemented by direct communication with the secretary of

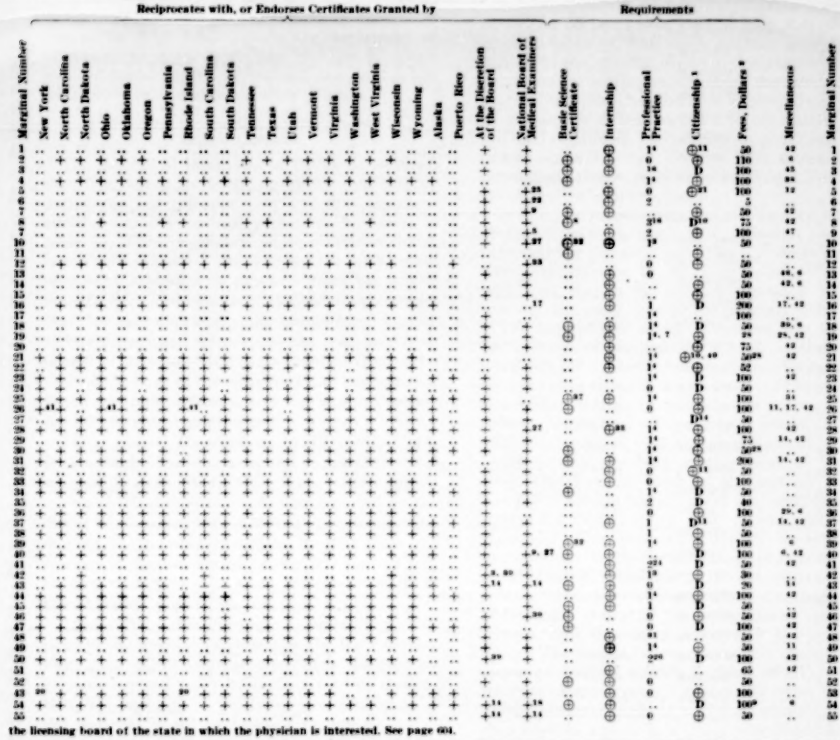
Some states have additional requirements for graduates of schools outside the United States and Canada.

+ indicates reciprocal or endorsement relationships have been established; .. indicates no reciprocal or endorsement relationships have been established. (See column—"At the discretion of the board.")

1. D. Declaration of intention of citizenship. ⊖ in citizenship column indicates full citizenship required; in other columns it implies a requirement.
2. In most cases there is a small additional recording or registration fee.
3. Year of practice after internship required.
4. Internship accepted in lieu of one year's practice.
5. Two years' professional practice required.
6. All applicants must be graduates of a medical school approved by the American Medical Association.
7. Just preceding application.
8. Not required if applicant has been in practice more than 5 years.
9. Basic science certificate required either by reciprocity or examination in addition to basic science subjects of National Board.
10. Canadian citizens are required to file first papers.
11. Not applicable to citizens of Canada.
12. Oral examination required when application is based on a license dated five or more years prior to filing application.
13. For reciprocity applicants.
14. Oral examination required.
15. Endorsement of National Board of Medical Examiners, $35.
16. Active practice for a period of not less than three years immediately preceding date of application.
17. Practical clinical examination required.
18. In lieu of its own examination, certificate of National Board may be accepted in whole or in part.
19. Minimum fee.
20. Licentiates of California, Colorado, Indiana, Iowa, Kansas, Massachusetts, New York, and Rhode Island accepted on reciprocal basis at discretion of board.
21. Not required if country in which applicant is licensed will admit to practice citizens of the United States licensed to practice in some state or on proof of requirements similar to those required by California for graduates of foreign medical schools.
22. At discretion of Health Director.

The largest number of candidates presenting the same type of credential were 3,215 diplomates certified by the National Board of Medical Examiners. There were 345 licenses issued in Pennsylvania, 296 in Illinois, 295 in Missouri, 268 in Michigan, 251 in Ohio, and 219 in New York that were presented to other states for reciprocal registration. California, which issued the greatest number of licenses by reciprocity or endorsement (1,656) certified only 173 of its licentiates to other states. Figures in other states were fewer than 200. Forty-one medical officers of one of the federal services received licenses by endorsement of military credentials in six states. Eleven were licensed by six boards on the basis of a license issued in the Canal Zone, Hawaii, or Puerto Rico. None were regis-

1959
V. 1



the licensing board of the state in which the physician is interested. See page 604.

23. Oral examination required if applicant's state requires it.
24. If the applicant passes the examination in the state from which he transfers after the completion of his internship, no practice is required.
25. May require oral examination.
26. Internship accepted at the discretion of the board as the equivalent of two years' practice.
27. Fee, $25.
28. Fee same as applicant's state charges but not less than $50.
29. Graduates of foreign medical schools are accepted at the discretion of the board.
30. Diplomates of National Board not required to have been in practice for three years.
31. Same as required of candidates of state applying for licensure.
32. Not required for licensure by reciprocity.
33. Reciprocity applicants only.
34. Supplemental examination required in certain cases when accepting the examination of a state with whom reciprocal relations have not been established.
35. Applicants issued certificates prior to October, 1953, acceptable.
36. Fee same as applicant's state charges but not less than $75.
37. For matriculants after Oct. 15, 1957.
38. Graduates of foreign schools not accepted.
39. Reciprocity extended at discretion of board to candidates whose qualifications would entitle them to admission to examination and who took examinat on equivalent to that required by this board.
40. Permanent license withheld until completion of citizenship.
41. At the discretion of the board.
42. Graduates of foreign medical schools are not accepted for licensure by reciprocity.
43. Reciprocity extended at discretion of board to states having comparable licensing requirements and which accept Colorado applicants on a substantially equal reciprocal basis.
44. Consecutive years immediately preceding application.
45. Graduates of medical schools in Canada and foreign medical graduates are not accepted for licensure by reciprocity.
46. Must be residents of the Canal Zone or Republic of Panama.

tered presenting a license from Alaska. There were 59 registered by eight boards on the basis of Canadian or foreign credentials, and 8 were licensed by two boards by special exemption.

In table 10 are reported the numbers from individual schools represented by the 7,925 reciprocity licentiates. Every approved medical school in the United States and the University of Puerto Rico had graduates licensed without written examination in 1958. All of the approved Canadian schools were so registered with one exception—the University of Saskatchewan. The 7,925 licentiates included 7,330 graduates of approved schools in the United States and 173 from Canadian medical schools. Licenses without written examination were obtained by 250 foreign-trained physicians; 18 gradu-

TABLE 9.—*Candidates Licensed by Reciprocity and Endorsement of Credentials, 1958*

States Issuing Licenses by Reciprocity or Endorsement	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	U. S. Govt. Services	National Board of Medical Examiners	Canal Zone, Guam, Hawaii, Puerto Rico, Virgin Islands	Canadian and Foreign	Special Endorsement	Total Licensed
Marginal Number.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	
Alabama	..	..	..	6	..	..	..	..	..	..	6	..	1	..	..	..	1	15	1	..	1	..	..	1	..	..	1	..	..	..	..	..	..	5	..	1	..	..	..	..	1	..	..	13	2	..	..	..	..	..	..	3	6	..	..	..	74
Alaska	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	5	..	..	10
Arizona	..	..	..	..	10	1	..	..	..	1	..	..	2	..	5	2	..	2	..	..	1	..	10	11	..	2	..	6	..	..	..	..	2	..	1	4	..	..	5	..	..	1	3	3	3	..	..	1	..	1	..	..	19	..	..	..	98
Arkansas	1	..	..	..	..	..	..	..	..	..	..	..	2	..	1	2	1	9	..	2	2	3	3	3	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	6	4	..	..	..	..	..	..	..	..	..	..	..	40
California	2	..	8	7	..	30	3	2	2	12	22	1	113	31	34	35	9	25	3	40	3	85	69	6	84	2	28	1	1	7	..	41	16	9	65	17	17	56	1	4	2	30	37	7	..	11	19	3	44	..	22	698	2	..	..	1,456
Colorado	..	..	1	..	10	..	..	..	..	..	2	..	4	2	4	1	2	5	..	2	..	5	2	..	22	..	8	..	..	..	..	1	2	..	..	7	3	..	1	..	..	1	5	1	..	..	2	..	..	..	..	30	..	..	..	121
Connecticut	..	..	1	..	1	..	..	..	..	..	..	..	4	..	1	..	..	..	..	5	3	2	1	..	2	..	1	2	1	..	19	..	..	..	..	1	7	..	..	..	..	1	1	1	2	1	..	..	..	..	..	101	..	..	..	221
Delaware	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	19
District of Columbia	..	..	..	..	2	2	1	..	..	..	3	..	3	1	1	..	1	2	5	30	..	..	..	2	1	1	..	..	..	..	..	..	7	5	..	3	1	..	7	1	2	..	..	..	..	..	..	..	5	..	1	..	..	71	..	13	..	172
Florida	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6
Georgia	3	..	..	1	4	..	..	..	..	..	..	..	3	1	1	..	2	4	..	8	1	4	..	3	..	..	..	..	..	..	..	..	..	..	9	..	2	1	..	3	..	2	..	12	3	1	..	4	1	..	1	..	15	..	..	..	91
Idaho	..	..	..	..	3	5	..	..	..	..	1	..	2	1	1	2	1	..	..	..	..	1	..	2	..	..	1	..	..	..	..	..	..	..	1	1	2	3	..	..	..	..	..	2	..	..	..	2	..	..	..	..	4	..	..	..	35
Illinois	1	..	..	..	4	3	..	..	..	..	1	..	6	4	6	4	6	4	..	2	..	5	2	..	10	..	1	..	..	..	..	1	2	..	1	5	1	..	..	..	..	1	3	..	..	1	..	6	..	..	..	56	..	..	..	173
Indiana	1	..	..	1	3	1	..	..	..	2	4	..	13	..	1	6	8	..	..	6	10	3	1	..	15	..	3	..	1	..	..	3	..	..	17	..	..	..	..	..	..	..	1	3	..	..	..	..	1	..	2	..	..	..	14	..	129
Iowa	..	..	..	3	1	..	..	..	..	1	1	..	6	1	..	3	1	1	..	3	1	..	3	..	5	..	8	..	..	2	..	3	..	..	6	..	1	3	..	1	..	1	4	2	..	..	3	..	..	..	7	..	18	1	..	..	86
Kansas	..	..	..	..	3	2	..	..	..	..	..	..	1	1	..	..	2	1	..	1	..	2	1	..	3	..	1	..	..	..	..	..	..	..	1	4	..	..	..	..	..	..	1	4	..	..	..	..	..	..	..	..	6	..	..	..	34
Kentucky	2	..	..	2	1	1	..	..	..	..	4	..	3	1	..	..	..	2	..	..	3	5	2	5	1	..	2	..	..	..	..	..	2	3	..	5	2	..	1	..	3	1	19	..	..	..	6	..	1	..	..	22	..	..	..	99
Louisiana	3	..	..	7	..	1	..	..	..	..	8	..	3	5	2	4	1	..	..	8	..	3	5	25	2	..	..	..	..	..	..	..	3	..	..	4	3	1	2	..	3	..	4	22	..	..	2	..	..	..	..	..	..	..	..	121
Maine	..	..	..	..	2	..	..	..	..	1	..	..	1	..	..	..	..	..	..	1	1	1	..	..	..	..	1	2	..	..	..	..	..	..	..	1	..	..	3	5	..	..	..	..	1	..	..	..	..	..	..	..	21	..	..	..	41
Maryland	2	..	1	4	..	..	..	..	11	..	5	..	4	1	..	1	1	2	..	..	..	..	2	..	9	..	3	..	3	..	5	9	..	2	1	..	9	1	..	1	..	..	1	4	22	..	..	9	..	1	..	..	90	..	..	..	180
Massachusetts	..	..	..	..	9	..	4	..	..	..	..	..	..	..	2	4	1	2	9	..	..	..	..	..	5	..	3	..	..	..	..	6	2	..	2	..	12	2	..	..	3	2	..	3	5	..	4	..	..	..	..	..	292	..	..	..	379
Michigan	..	..	..	..	11	4	..	..	1	..	3	..	11	6	4	2	5	3	..	9	..	..	7	..	12	..	4	..	1	..	..	6	1	..	25	2	..	5	2	1	1	2	..	3	..	3	..	..	..	..	..	22	1	..	..	169
Minnesota	1	..	2	..	8	2	..	..	..	..	1	1	6	8	5	5	1	4	..	2	..	9	..	..	5	11	..	..	..	..	..	2	1	..	5	1	..	11	..	1	4	5	..	3	..	8	..	..	..	..	..	92	..	..	..	162
Mississippi	..	..	..	1	..	..	..	..	..	..	1	..	..	1	..	..	..	9	..	2	..	1	..	..	1	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	9	2	..	..	..	..	..	..	..	3	..	..	..	32
Missouri	..	..	..	7	2	1	..	..	..	..	2	..	9	1	1	28	5	4	..	1	..	2	2	1	..	..	..	..	..	..	..	..	..	..	3	..	..	4	..	..	2	7	1	..	3	..	..	5	..	..	..	33	..	..	..	127
Montana	..	..	..	1	..	2	1	..	..	..	1	2	2	1	..	2	..	..	..	..	..	1	..	2	..	4	..	..	..	..	..	..	..	2	..	1	1	1	..	..	1	1	1	..	..	..	..	..	..	..	..	9	..	..	..	34
Nebraska	..	..	..	..	1	..	..	..	..	..	..	..	4	2	8	3	..	..	..	1	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	1	..	..	..	2	..	..	..	..	..	..	..	..	2	..	..	..	30
Nevada	..	..	..	..	8	..	..	..	..	..	2	..	1	..	..	..	..	..	..	1	..	1	5	..	..	..	1	..	1	..	3	..	2	1	1	2	..	1	..	..	1	2	..	1	..	..	..	1	..	..	7	..	..	..	41
New Hampshire	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	2	2	..	1	1	..	..	..	..	..	..	..	1	..	1	1	..	3	..	..	3	1	..	..	1	1	..	..	2	..	1	..	..	16	..	7	..	44
New Jersey	..	..	..	1	1	1	1	..	..	..	4	..	5	2	2	..	..	6	2	2	16	1	1	..	13	..	1	..	..	..	..	20	1	..	4	..	56	9	..	..	..	3	..	1	1	..	..	..	..	..	144	..	..	..	340
New Mexico	..	..	..	1	3	4	1	..	1	..	1	3	1	1	3	3	..	2	1	1	3	1	..	..	1	..	1	..	..	..	..	..	..	..	..	..	2	..	..	..	2	4	..	1	1	..	..	1	..	..	5	..	..	..	32
New York	2	..	..	..	12	1	..	..	1	..	..	..	2	5	5	..	6	8	..	16	3	12	5	..	1	..	4	..	..	12	..	..	8	..	..	..	..	34	..	..	..	6	11	..	5	9	3	1	6	..	11	984	5	5	2	1,154
North Carolina	1	..	..	1	4	1	..	..	1	..	13	..	1	1	1	..	1	1	..	6	..	3	1	1	3	..	..	..	..	..	..	2	3	..	..	..	..	1	..	5	..	8	3	..	..	6	..	2	1	..	..	71	..	..	..	71
North Dakota	..	..	..	..	1	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	3	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..	..	..	19
Ohio	..	..	..	2	11	..	5	..	..	1	3	..	17	15	3	4	6	4	10	25	..	16	6	1	21	..	2	..	3	3	..	11	4	1	..	..	1	31	7	1	1	8	1	..	9	1	10	4	1	..	92	1	..	..	345
Oklahoma	3	..	..	4	1	1	1	..	..	..	2	..	2	..	2	5	1	2	..	2	1	..	2	1	1	..	1	..	..	..	..	1	..	..	1	..	..	..	..	..	..	3	6	..	..	1	..	..	..	..	6	..	..	..	50
Oregon	..	..	1	1	4	5	..	..	..	..	2	2	2	1	4	2	..	1	..	2	1	1	4	..	3	..	4	..	..	..	..	1	..	..	1	..	..	1	..	..	..	..	1	8	1	3	..	..	..	..	25	..	..	..	77
Pennsylvania	1	..	..	..	7	2	1	3	..	2	4	..	5	..	1	3	2	2	..	10	1	5	4	1	1	1	2	..	..	11	..	9	5	..	14	1	..	..	..	..	1	2	1	4	..	2	3	..	3	139	1	..	..	241
Rhode Island	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	2	..	..	1	2	..	..	..	..	..	..	..	..	..	..	1	..	..	..	2	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	15	..	..	..	28
South Carolina	1	..	..	..	1	..	..	..	..	10	..	1	..	..	..	..	1	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..	..	..	1	..	..	..	..	4	..	1	..	..	..	..	..	..	4	..	..	..	33
South Dakota	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	2	3	..	1	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	1	1	..	1	..	..	1	..	..	3	..	..	..	24
Tennessee	1	..	..	2	1	2	..	..	..	..	6	..	3	1	..	..	5	2	..	1	2	1	1	12	..	..	..	..	..	1	..	3	5	..	4	..	..	4	..	..	..	..	4	1	..	5	1	1	2	..	..	14	..	..	..	85
Texas	3	..	..	11	4	4	..	..	2	1	2	..	16	8	2	4	9	25	..	9	1	4	4	7	38	..	6	..	..	2	..	7	5	..	11	13	..	9	..	1	..	13	..	1	..	4	..	1	6	4	..	..	..	..	..	237
Utah	..	..	..	..	9	2	..	..	..	..	1	2	4	1	1	2	..	2	..	6	..	..	..	..	..	1	..	1	..	..	..	3	..	1	3	1	1	..	..	..	..	1	..	1	1	..	1	..	..	1	1	13	..	..	..	59
Vermont	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	4	..	..	2	..	5	..	..	..	..	..	..	..	..	..	..	..	1	..	..	20	..	2	..	36
Virginia	..	..	..	..	4	..	..	..	2	..	4	..	1	..	..	..	4	1	12	..	..	2	..	4	..	..	..	..	..	..	..	2	9	..	4	..	12	..	2	..	3	1	1	..	..	1	3	..	..	..	47	..	..	..	120
Washington	..	..	2	1	14	4	..	..	2	..	..	1	13	2	8	4	1	1	..	4	..	8	12	..	13	1	7	..	..	..	..	5	..	..	5	3	10	3	2	..	..	5	2	2	..	2	..	..	..	..	48	..	13	..	200
West Virginia	..	..	..	..	..	..	..	..	..	..	2	..	4	..	..	1	3	..	..	8	1	3	1	..	1	..	..	..	..	1	..	2	2	..	9	..	..	10	..	1	..	5	..	..	10	..	..	..	..	..	11	..	..	..	75
Wisconsin	..	..	..	..	7	4	3	..	1	..	1	..	16	5	3	1	1	1	2	..	9	8	..	5	..	5	..	..	..	1	5	1	..	10	3	..	4	..	..	..	5	..	..	1	1	..	..	..	8	29	..	..	..	141
Wyoming	..	..	..	..	1	6	..	..	..	..	..	..	1	2	2	..	..	..	..	1	2	..	..	2	..	3	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	1	..	1	..	..	..	..	..	2	..	..	..	26
Canal Zone, Guam, Hawaii, Puerto Rico, and Virgin Islands	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	3	..	..	3	..	..	2	..	..	..	1	1	..	..	..	..	..	1	..	47	..	4	6	70
Totals	27	0	15	59	173	84	22	8	27	30	118	9	286	116	109	120	92	151	31	308	30	226	194	81	295	7	132	2	11	50	4	219	110	18	251	67	37	345	32	29	11	180	148	23	13	139	42	30	118	2	41	3,215	11	59	8	7,925
Marginal Number.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	

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ates of approved medical schools no longer in operation were registered, 26 graduates of unapproved medical schools, and 138 graduates of schools of osteopathy. This table reflects the movement of physicians to states other than the one in which they obtained their professional training or in which they first established their practice.

Licentiates Representing Additions to the Medical Profession

The number of licentiates of 1958 who received their first license to practice medicine and surgery during the last calendar year and thus represent additions to the medical profession is shown in table 11. The compilation of this table includes candidates examined and licensed in 1958, some who were examined in previous years but whose licenses were withheld until 1958 pending completion of a required internship, citizenship, or other technicalities, and physicians not previously licensed in any state who were certified during the year on the basis of the examination of the National Board of Medical Examiners. The majority represented are recent graduates.

There were 7,809 additions to the medical profession in the United States and its territories and outlying possessions. In 1958, there were approximately 3,700 deaths of physicians reported to the offices of the American Medical Association. Deducting the number of deaths in 1958 from the number of licenses issued for the first time, it will be seen that there was a net increase of 4,109 in the physician population last year.

Among the 7,809 licentiates representing additions to the medical profession in the last calendar year were 6,155 who secured their licenses by examination and 1,654 by endorsement of credentials. The majority of the latter were diplomats of the National Board of Medical Examiners.

The number of first licentiates, arranged in nine geographical divisions, are compiled in table 12. The geographical divisions representing the greatest number of additions to the medical profession were the Middle Atlantic States with 1,708, the East North Central States with 1,447, and the South Atlantic States with 1,184. More than 400 were added in each of five other groups—Pacific 790, West North Central 784, West South Central 748, New England 470, and East South Central 446. The Mountain States added 129 and the territories and possessions 103.

In the 24 years from 1935 to 1958, inclusive, there were 157,891 new additions to the medical profession as determined by the number who received their first license. Figures for each year during this period are presented in table 13. Of the 157,891 in this group, 131,252 were licensed after written examination and 26,639 by endorsement of credentials. The total number of licenses issued in the same period (table 2) was 282,486.

Registration of Physicians, 1904-1958

A tabulation of total numbers of physicians registered for 55 years from 1904 to 1958, inclusive, is given in table 14. This study contains figures pertaining to the number of physicians examined and registered by written examination, the annual percentage of failures, the number registered annually by reciprocity or endorsement of credentials, and the total registered. The number of physicians registered annually from 1904 to 1933 shows slight fluctuation, except in 1918, when only 4,231 were licensed.

In the years since 1946, the numbers registered decreased annually until 1952, although they far exceeded the prewar totals. The last six years has shown an increase in the number of physicians registered, though the number registered in 1958 was slightly lower than in the previous year.

The highest percentage of failures was 21.7 in 1908. Many of the medical schools at that time were proprietary institutions operating for financial returns rather than the improvement of the medical curriculum. Beginning in 1915, the percentage of failures began to drop, reaching a low of 5.7% in 1930. Beginning in 1936, the percentage of failures began to rise, reaching another peak of 20.7 in 1940. This was the result of the increase in the number of foreign-trained physicians seeking licensure in the United States, many of whom were not successful after repeated attempts at licensure examinations. While the percentage of failures have been reduced somewhat in recent years, it still reflects the unsuccessful attempts of foreign-trained physicians, graduates of unapproved medical schools, and schools of osteopathy to secure licenses. The annual failure rate among graduates of approved medical schools is about 4%. This table refers to examinations given annually rather than to individuals examined. A candidate who fails more than once in a state in a given year is counted as one failure, but should he again fail in a succeeding year, this fact is computed among the failures for that year. Likewise, a successful candidate securing a license in more than one state in a given year is counted in both states and likewise is counted if he passed examinations in later years. The figures in this table give only a fair approximation of the number of physicians added to the profession.

Graduates of Approved Schools and Others Registered, 1922-1958

In table 15, the numbers of physicians registered since 1922 are grouped in two categories, namely, graduates of approved medical schools and others. In the computation of these figures, schools rated in classes A and B prior to 1928 by the Council on Medical Education and Hospitals of the American Medical Association are included in the first grouping. In 1928, the classification of medical schools in categories of A, B, and C by the Council was discontinued, and a list of approved medical schools has since been maintained. In the column headed

Marginal Numbers	School	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	ALABAMA																			
1	Medical College of Alabama, Birmingham	1	..	1	..	2	..	..	..	..	..	3	..	..	..	..	..	..	1	..
	ARKANSAS																			
2	University of Arkansas School of Medicine, Little Rock	4	..	..	..	6	..	..	..	..	..	1	1	1	1	3	..	2	7	..
	CALIFORNIA																			
3	College of Medical Evangelists, Loma Linda, Los Angeles	1	1	2	..	19	2	..	..	2	..	5	..	..	..	2	..	1	..	..
4	University of California School of Medicine, Los Angeles	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	University of Southern California School of Medicine, Los Angeles	..	..	3	..	2	1	..	..	..	..	..	..	1	..	..	1	..	..	..
6	Stanford University School of Medicine, San Francisco	..	..	1	..	13	..	..	..	..	..	..	1	..	..	..	..	1	..	..
7	University of California School of Medicine, San Francisco	..	..	1	..	2	3	..	..	1	..	..	..	1	..	..	1	..	..	1
	COLORADO																			
8	University of Colorado School of Medicine, Denver	..	..	1	..	20	4	..	..	3	..	..	4	2	..	..	3	1	1	..
	CONNECTICUT																			
9	Yale University School of Medicine, New Haven	..	..	1	..	18	..	26	..	2	..	3	1	2	..	1	..	..	..	2
	DISTRICT OF COLUMBIA																			
10	Georgetown University School of Medicine, Washington	1	..	..	..	15	..	8	..	21	..	1	..	4	..	..	..	..	1	..
11	George Washington University School of Medicine, Washington	1	..	2	..	23	2	3	2	23	..	1	1	..	..	1	..	2	1	..
12	Howard University College of Medicine, Washington	1	..	..	..	18	2	..	..	20	..	..	..	2	1	1	..	..	..	..
	FLORIDA																			
13	University of Miami School of Medicine, Coral Gables	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	GEORGIA																			
14	Emory University School of Medicine, Emory University	4	..	..	..	8	1	..	..	..	..	3	1	..	1	..	..	3	3	..
15	Medical College of Georgia, Augusta	1	..	..	..	5	1	..	..	1	..	..	..	..	..	..	..	..	3	..
	ILLINOIS																			
16	Chicago Medical School	..	..	..	..	21	1	..	..	1	..	..	..	11	..	..	..	..	..	..
17	Northwestern University Medical School, Chicago	2	1	2	1	69	7	2	..	1	..	1	2	16	4	4	1	3	1	1
18	Stritch School of Medicine of Loyola University, Chicago	..	..	1	..	31	..	1	..	..	..	..	1	16	1	3	..	1	1	..
19	University of Chicago, The School of Medicine	..	..	1	..	21	..	1	..	1	..	..	..	11	4	..	1	..	1	..
20	University of Illinois College of Medicine, Chicago	1	..	4	..	61	2	2	..	2	..	3	2	15	6	4	..	1	1	..
	INDIANA																			
21	Indiana University School of Medicine, Indianapolis	..	..	1	..	33	2	..	..	1	..	1	1	6	..	1	1	..	5	..
	IOWA																			
22	State University of Iowa College of Medicine, Iowa City	..	..	5	2	38	3	2	..	1	..	1	1	6	1	2	1	..	2	..
	KANSAS																			
23	University of Kansas School of Medicine, Kansas City	..	..	3	2	31	1	..	..	..	..	..	2	2	4	3	..	..	4	..
	KENTUCKY																			
24	University of Louisville School of Medicine	1	..	..	1	12	1	..	..	..	..	2	1	6	5	1	1	1	..	..
	LOUISIANA																			
25	Louisiana State University School of Medicine, New Orleans	4	..	2	4	5	1	..	..	2	..	1	..	2	..	..	1	..	..	..
26	Tulane University of Louisiana School of Medicine, New Orleans	12	..	..	4	22	2	1	..	..	..	4	..	1	1	2	..	2	16	1
	MARYLAND																			
27	Johns Hopkins University School of Medicine, Baltimore	1	1	1	1	22	2	4	..	4	..	4	..	1	1	1	..	1	4	..
28	University of Maryland School of Medicine and College of Physicians and Surgeons, Baltimore	..	..	2	2	13	1	3	1	5	..	2	..	..	4	..	..	..	1	..
	MASSACHUSETTS																			
29	Boston University School of Medicine	..	..	..	..	15	1	4	..	2	..	..	..	2	..	1	..	3	..	..
30	Harvard Medical School, Boston	1	2	4	1	43	3	15	..	2	..	2	1	2	2	..	..	6	1	3
31	Tufts University School of Medicine, Boston	..	..	..	1	28	..	13	..	1	..	..	..	3	..	..	..	1	..	9
	MICHIGAN																			
32	University of Michigan Medical School, Ann Arbor	..	..	4	1	49	4	1	..	..	..	3	..	4	6	1	2	1	3	..
33	Wayne State University College of Medicine, Detroit	..	..	2	1	27	..	1	..	..	..	..	..	..	1	..	..	1	..	..
	MINNESOTA																			
34	University of Minnesota Medical School, Minneapolis	2	..	9	1	59	2	1	..	1	..	..	1	1	1	2	1	1	2	..
	MISSISSIPPI																			
35	University of Mississippi School of Medicine, Jackson	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
	MISSOURI																			
36	University of Missouri School of Medicine, Columbia	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37	Saint Louis University School of Medicine	1	1	1	..	34	4	2	..	2	..	..	1	9	5	1	..	1	2	..
38	Washington University School of Medicine	..	1	1	..	53	6	..	1	..	..	3	..	4	2	2	..	1	..	..
	NEBRASKA																			
39	Creighton University School of Medicine, Omaha	..	..	3	1	24	6	..	..	..	..	..	1	..	1	7	3	..	..	..
40	University of Nebraska College of Medicine, Omaha	1	2	6	..	29	8	1	..	..	..	..	..	3	1	3	2	2	..	..
	NEW YORK																			
41	Albany Medical College of Union University	..	..	..	..	10	1	2	..	1	..	1	..	..	..	..	..	1	..	1
42	University of Buffalo School of Medicine	..	..	2	..	35	..	..	1	1	..	2	..	..	..	1	..	1	..	..
43	Columbia University College of Physicians and Surgeons, New York	1	1	..	..	41	3	19	..	3	..	..	..	..	..	1	1	6	..	2
	Marginal Numbers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

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20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Canal Zone, Guam, Puerto Rico, Trust Territories, and Virgin Islands	Totals	Marginal Numbers
2	1	..	1	..	..	..	..	..	..	..	..	2	1	..	..	..	..	1	..	..	..	1	2	..	..	..	..	..	..	..	..	10	1
1	1	..	1	3	7	1	..	..	..	..	1	1	1	..	2	4	2	..	..	..	..	2	11	..	..	..	..	..	..	..	1	65	2
4	..	7	6	..	1	..	1	1	..	..	1	3	3	..	4	..	6	..	..	..	..	3	2	2	..	4	6	..	1	..	3	95	3
2	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	1	8	4
..	1	..	..	..	..	..	..	1	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14	5
1	4	1	..	..	..	..	..	1	..	..	..	2	..	..	1	1	1	1	..	..	..	1	1	1	..	1	1	..	..	1	..	37	6
..	..	4	3	..	1	2	..	..	..	1	4	1	1	..	..	1	4	1	..	..	..	1	3	..	..	..	2	1	3	4	..	76	8
6	9	1	1	..	2	1	..	..	2	2	..	33	..	..	2	1	1	2	1	..	..	1	..	1	2	..	3	1	1	..	..	129	9
25	13	..	1	1	2	2	..	..	..	8	..	34	..	..	7	..	..	7	..	..	..	..	2	..	..	11	..	1	..	..	1	169	10
17	2	1	3	..	1	..	..	..	..	4	1	14	..	1	3	1	..	7	..	1	..	..	4	..	..	8	3	1	2	..	..	138	11
6	1	4	1	1	2	..	..	..	..	2	1	8	2	..	4	1	..	3	..	1	..	..	1	..	..	2	..	1	1	..	1	87	12
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	13
1	..	..	..	..	..	..	..	1	..	2	1	..	5	..	..	..	..	1	..	4	..	2	3	..	1	1	..	..	..	..	..	45	14
..	..	..	..	..	..	..	..	1	..	2	1	1	5	..	1	1	..	..	..	7	..	3	..	1	1	1	1	..	..	..	..	35	15
..	4	2	1	..	1	..	..	..	..	12	..	46	1	..	3	..	1	1	1	..	..	..	2	..	..	1	2	..	1	..	..	113	16
2	3	4	11	..	3	4	..	1	1	5	..	15	1	2	11	4	3	4	..	..	..	1	2	3	..	1	11	..	10	..	4	226	17
3	4	2	1	..	..	..	1	1	..	1	..	9	..	..	6	..	..	3	..	..	..	1	4	1	..	..	1	..	..	..	..	86	18
2	1	5	7	..	4	1	2	1	..	2	1	3	1	1	6	1	3	1	..	..	1	2	3	1	..	1	5	3	9	1	..	175	19
2														4																	2		20
1	1	5	6	1	3	2	2	..	..	2	1	4	1	..	14	..	1	..	..	..	..	1	6	1	..	..	2	..	6	1	2	115	21
1	3	5	5	..	1	..	2	1	..	2	1	5	1	..	2	3	3	1	..	..	..	1	3	..	..	1	7	..	4	2	..	119	22
1	3	2	5	..	28	2	1	..	..	..	3	2	..	2	3	4	2	3	..	..	..	1	4	2	..	..	4	1	1	1	..	130	23
1	..	4	1	..	5	2	..	..	..	..	..	6	1	..	7	1	..	2	..	1	..	4	4	..	..	..	1	3	1	..	..	76	24
1	..	1	1	1	1	..	..	..	..	..	..	..	1	..	..	1	..	1	..	..	1	1	8	..	..	1	..	..	..	..	..	41	25
..	..	1	3	7	2	..	..	..	..	2	2	8	..	..	5	1	..	1	..	..	..	1	17	1	..	..	1	..	..	..	2	123	26
4	4	5	1	..	2	..	1	..	..	7	..	19	5	..	10	2	..	4	..	2	..	3	6	2	1	6	1	5	2	..	..	140	27
2	4	1	1	1	2	..	..	1	..	1	2	5	1	1	6	..	..	5	..	2	..	..	3	4	..	5	1	2	..	..	2	86	28
..	37	1	..	1	..	..	..	1	2	6	..	22	..	..	3	..	..	2	1	1	..	..	1	3	1	1	3	1	1	..	..	112	29
3	69	1	..	..	..	..	..	1	3	4	1	39	..	1	7	2	1	9	1	1	..	4	..	1	2	4	3	3	1	1	..	267	30
1	24	1	..	..	..	..	..	1	3	4	1	17	..	..	6	1	..	4	..	1	..	1	..	1	1	2	2	..	2	..	..	105	31
..	3	2	6	..	2	..	..	1	2	3	1	4	2	1	11	..	1	4	..	..	2	1	2	1	..	1	1	1	10	..	1	142	32
..	..	..	2	..	1	..	..	..	..	1	..	3	..	..	..	..	..	1	..	..	..	1	1	..	..	..	2	..	..	..	..	44	33
2	1	3	1	..	1	1	1	4	..	2	2	3	1	..	3	..	3	1	..	..	1	..	2	..	..	2	6	..	3	..	2	129	34
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	35
..	..	1	..	..	..	..	1	..	..	..	1	..	..	..	16	..	..	..	..	..	..	..	2	..	..	..	2	1	3	..	..	3	36
4	2	2	3	..	1	1	..	1	..	..	..	12	1	..	3	2	1	1	..	..	..	1	4	..	..	3	5	..	1	..	..	125	37
5	2	2	3	..	1	1	..	1	..	..	..	12	1	..	3	2	1	1	..	..	..	1	4	..	..	3	5	..	1	..	..	123	38
1	2	3	3	..	2	1	1	1	..	1	1	6	..	1	1	1	3	1	..	..	2	..	2	..	..	..	7	..	1	..	2	93	39
3	1	2	11	..	1	4	2	..	..	..	1	3	..	1	2	1	2	3	..	..	5	..	7	..	..	..	3	..	4	3	..	117	40
2	3	..	1	..	..	..	..	2	..	4	1	37	..	..	1	..	..	1	..	..	..	1	..	..	1	..	..	..	..	1	..	70	41
2	4	..	2	..	1	1	..	..	..	2	1	51	..	..	5	..	..	5	..	..	..	1	..	2	1	1	2	..	1	..	..	127	42
6	9	..	3	..	1	..	..	1	1	11	2	92	..	1	5	..	3	2	1	..	..	..	2	1	2	3	3	..	1	1	2	220	43
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	

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Marginal Numbers	School	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine
	Marginal Numbers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	NEW YORK																			
44	Cornell University Medical College, New York	..	..	1	..	26	2	13	..	2	..	1	1	..	2	1	..	2	..	..
45	New York Medical College, Flower and Fifth Avenue Hospitals, New York	1	1	..	..	35	2	13	2	2	..	..	..	..	1	1	..	..	..	1
46	New York University College of Medicine, New York	..	..	..	..	43	2	14	1	8	..	2	..	2	1	1	..	1	1	1
47	State University of New York, Downstate Medical Center, New York	..	..	..	..	36	1	14	..	3	..	..	1	..	1	1	..	..	..	..
48	University of Rochester School of Medicine and Dentistry	1	..	1	..	13	1	4	..	1	..	..	..	3	..	1	..	2	..	..
49	State University of New York, Upstate Medical Center, Syracuse	..	..	..	..	20	..	4	..	1	..	1	..	..	..	1	..	..	..	..
	NORTH CAROLINA																			
50	University of North Carolina School of Medicine, Chapel Hill	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
51	Duke University School of Medicine, Durham	2	..	1	2	14	..	2	1	1	..	3	..	..	..	..	..	4	1	..
52	Bowman Gray School of Medicine of Wake Forest College, Winston-Salem	..	..	..	1	8	..	..	..	1	..	4	..	..	..	..	..	..	1	..
	OHIO																			
53	University of Cincinnati College of Medicine	..	..	1	..	25	3	..	..	1	..	..	..	1	6	3	..	4	1	..
54	Western Reserve University School of Medicine, Cleveland	..	..	3	..	22	..	..	..	2	..	..	..	4	4	2	1	1	..	..
55	Ohio State University College of Medicine, Columbus	1	..	1	..	21	2	..	..	..	..	2	1	1	3	..	..	..	2	..
	OKLAHOMA																			
56	University of Oklahoma School of Medicine, Oklahoma City	..	..	..	..	18	3	..	..	1	..	1	1	..	1	..	4	2	3	..
	OREGON																			
57	University of Oregon Medical School, Portland	1	3	1	..	20	..	..	..	..	..	..	3	2	..	1	..	..	1	..
	PENNSYLVANIA																			
58	Hahnemann Medical College and Hospital of Philadelphia	1	..	..	..	17	1	2	1	..	..	..	1	..	4	3	1	..	2	..
59	Jefferson Medical College of Philadelphia	1	..	3	..	29	2	1	1	..	..	2	..	2	2	1	..	..	1	1
60	Temple University School of Medicine, Philadelphia	..	..	2	..	21	..	1	2	1	..	1	1	1	..	1	1	..	..	..
61	University of Pennsylvania School of Medicine, Philadelphia	1	..	2	..	32	..	5	..	5	..	1	..	3	4	2	..	3	..	3
62	Woman's Medical College of Pennsylvania, Philadelphia	1	..	1	..	10	..	..	..	1	..	1	..	..	1	..	..	..	..	..
63	University of Pittsburgh School of Medicine	..	..	1	..	13	..	..	1	1	..	..	1	1	1	..	..	2	1	..
	PUERTO RICO																			
64	University of Puerto Rico School of Medicine, San Juan	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	SOUTH CAROLINA																			
65	Medical College of South Carolina, Charleston	1	..	..	..	3	1	..	..	1	..	2	..	..	..	1	..	2	3	..
	TENNESSEE																			
66	University of Tennessee College of Medicine, Memphis	16	1	3	9	18	..	1	..	..	..	9	..	1	..	1	1	17	6	..
67	Meharry Medical College, Nashville	..	..	..	..	20	..	1	..	3	..	..	..	..	3	2	..	2	2	..
68	Vanderbilt University School of Medicine, Nashville	3	..	..	..	9	1	..	..	1	..	3	..	2	1	2	..	4	4	..
	TEXAS																			
69	University of Texas Southwestern Medical School, Dallas	1	..	..	..	12	..	1	..	..	..	2	..	..	1	..	..	..	2	..
70	University of Texas Medical Branch, Galveston	..	..	..	..	15	4	1	..	..	..	1	1	3	..	1	..	..	15	..
71	Baylor University College of Medicine, Houston	..	..	2	3	11	..	..	..	..	..	..	1	1	..	1	2	..	5	..
	UTAH																			
72	University of Utah School of Medicine, Salt Lake City	..	..	2	..	11	1	1	..	1	..	..	..	..	..	..	..	..	..	..
	VERMONT																			
73	University of Vermont College of Medicine, Burlington	..	..	..	..	7	..	5	1	..	..	..	..	1	..	..	..	..	..	3
	VIRGINIA																			
74	University of Virginia School of Medicine, Charlottesville	..	..	..	..	8	..	..	..	4	..	3	..	1	2	1	..	2	5	..
75	Medical College of Virginia, Richmond	..	..	..	..	5	..	2	1	1	..	1	..	..	1	..	..	4	1	..
	WASHINGTON																			
76	University of Washington School of Medicine, Seattle	..	..	..	..	21	2	1	..	..	..	1	..	..	..	..	..	..	1	..
	WISCONSIN																			
77	University of Wisconsin Medical School, Madison	..	..	1	..	19	..	1	..	1	..	1	..	2	2	3	..	..	..	..
78	Marquette University School of Medicine, Milwaukee	..	..	3	..	27	..	..	..	..	..	..	..	4	2	3	..	..	..	..
	CANADA																			
79	University of Alberta Faculty of Medicine, Edmonton	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
80	University of British Columbia School of Medicine, Vancouver	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
81	University of Manitoba Faculty of Medicine, Winnipeg	..	..	..	..	10	..	..	..	..	..	..	..	..	..	1	..	..	..	..
82	Dalhousie University Faculty of Medicine, Halifax	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	1	..	1
83	Queen's University Faculty of Medicine, Kingston	1	..	..	..	3	..	1	..	..	..	..	..	..	..	..	..	..	..	..
84	University of Western Ontario Faculty of Medicine, London	..	..	..	..	1	..	1	..	..	..	..	..	..	1	..	..	..	..	..
85	University of Ottawa Faculty of Medicine, Ottawa	..	..	..	..	3	..	3	..	..	..	..	..	..	..	..	..	..	..	1
86	University of Toronto Faculty of Medicine, Toronto	..	1	..	..	8	..	3	..	..	..	..	..	1	..	..	..	..	..	..
87	McGill University Faculty of Medicine, Montreal	..	..	2	..	14	1	8	..	1	..	..	..	..	2	1	..	1	..	2
88	University of Montreal Faculty of Medicine, Montreal	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..
89	Laval University Faculty of Medicine, Quebec	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
90	University of Saskatchewan College of Medicine, Saskatoon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	OTHERS																			
91	Foreign Medical Faculties	..	..	..	..	..	..	5	2	26	..	1	..	..	17	1	..	..	..	8
92	Extinct Medical Schools	..	..	..	1	2	..	1	..	1	..	..	..	..	2	2	..	..	..	..
93	Unapproved Medical Schools	..	..	..	1	11	..	..	..	1	..	1	..	..	..	..	..	..	..	..
94	Schools of Osteopathy	..	..	..	..	..	15	..	1	..	..	..	..	..	12	..	4	..	..	..
95	Totals	74	16	98	40	1,656	121	221	19	172	0	91	35	173	129	88	34	99	121	41
	Marginal Numbers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

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20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Canal Zone, Guam, Hawaii, Puerto Rico, and Virgin Islands	Totals	Marginal Numbers
..	10	4	1	..	1	..	..	1	1	10	..	61	..	1	5	1	1	5	..	..	..	3	..	1	2	2	1	..	2	..	2	106	44
15	11	..	..	..	1	..	..	..	1	14	..	572	1	..	1	..	..	14	12	..	..	..	1	..	..	6	1	1	1	..	1	132	65
15	5	6	..	1	..	1	1	..	..	16	..	933	..	..	1	..	1	15	..	..	..	..	1	1	..	1	..	..	..	..	..	23	67
2	9	..	1	..	..	..	..	..	..	3	..	56	..	..	5	..	..	5	..	..	..	1	1	1	1	..	1	2	1	..	..	112	49
1	..	1	1	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	1	..	1	1	..	..	..	1	..	1	..	10	10
2	2	..	..	..	1	..	..	1	1	1	..	8	1	..	1	..	..	6	..	..	4	..	2	3	1	..	..	1	..	..	..	72	34
3	..	..	..	2	..	..	..	..	..	2	..	1	1	..	..	..	..	2	..	..	1	1	2	3	1	..	..	..	..	..	..	25	32
1	1	2	1	..	..	1	..	..	..	1	2	..	1	..	..	1	..	1	1	..	..	..	13	1	..	..	3	..	3	1	..	68	38
..	..	..	2	..	..	1	..	2	..	..	2	..	..	..	1	..	16	..	..	..	..	..	..	2	..	..	14	..	..	..	1	72	37
4	4	..	3	..	1	..	1	..	..	10	..	16	1	..	4	..	..	1	12	..	..	1	1	4	1	..	1	1	1	1	..	56	36
6	7	1	1	..	1	1	1	1	1	12	..	19	1	..	11	..	..	12	12	..	..	1	..	1	..	..	3	1	..	..	..	55	36
2	2	..	..	..	..	..	..	..	..	2	..	4	..	..	1	..	..	2	2	..	..	..	..	..	..	..	1	..	..	..	..	13	36
1	1	..	..	..	..	..	1	..	..	1	..	7	1	..	11	..	..	5	1	..	1	1	..	..	..	..	2	..	..	..	..	37	62
1	..	..	..	..	..	..	1	..	..	1	..	2	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	19	38	41
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1	2	..	..	..	1	..	..	..	..	1	..	6	3	..	3	1	1	1	..	1	..	1	1	..	..	..	1	4	1	2	1	31	38
2	2	..	..	..	..	..	..	..	1	..	..	1	..	..	..	3	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	11	69
1	1	1	2	1	..	..	..	..	..	1	..	1	..	..	1	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	6	27
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..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	78
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	79
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	80
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	81
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	82
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	83
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	84
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	85
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	86
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	87
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	88
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	89
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	90
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	91
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	92
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	93
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	94
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	95
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	96
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	97
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	98
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	99
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	100
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	101
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	102
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	103
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	104
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	105
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	106
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	107
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	108
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	109
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	110
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	111
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	112
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	113
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..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	115
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	116
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	117
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	118
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	119
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	120
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..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	127
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	128
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..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	131
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	132
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190	329	160	162	82	137	34	80	41	44	340	52	1,154	71	19	345	50	77	241	58	33	24	85	257	50	36	126	360	75	141	58	70	1,925	95
30	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	

"Others" are included graduates of foreign faculties of medicine, class C graduates, osteopaths given recognition by medical licensing boards, and graduates of schools not approved by the Council subsequent to 1928.

TABLE 11.—*Licentiates Representing Additions to the Medical Profession, 1958*

	Examination	Reciprocity and Endorsement	Total
Alabama	73	3	76
Alaska	4	..	4
Arizona	7	6	13
Arkansas	86	..	86
California	492	190	682
Colorado	73	8	81
Connecticut	96	80	176
Delaware	5	..	5
District of Columbia	6	46	52
Florida	137	..	137
Georgia	232	5	237
Idaho	3	1	4
Illinois	324	63	387
Indiana	170	9	179
Iowa	90	4	94
Kansas	114	1	115
Kentucky	93	9	102
Louisiana	229	..	229
Maine	20	2	22
Maryland	262	18	280
Massachusetts	11	196	207
Michigan	297	8	305
Minnesota	171	12	183
Mississippi	120	..	120
Missouri	262	7	269
Montana	1	1	2
Nebraska	109	1	110
Nevada	2	1	3
New Hampshire	5	9	14
New Jersey	106	28	134
New Mexico	3	..	3
New York	294	760	1,054
North Carolina	178	..	178
North Dakota	6	..	6
Ohio	401	43	444
Oklahoma	81	3	84
Oregon	27	..	27
Pennsylvania	472	48	520
Rhode Island	38	6	44
South Carolina	59	1	60
South Dakota	7	..	7
Tennessee	145	3	148
Texas	346	3	349
Utah	15	4	19
Vermont	6	1	7
Virginia	208	14	222
Washington	59	18	77
West Virginia	12	1	13
Wisconsin	127	5	132
Wyoming	4	..	4
Canal Zone	..	4	4
Hawaii	9	7	16
Guam	..	2	2
Puerto Rico	57	22	79
Virgin Islands	1	1	2
Totals	6,155	1,654	7,809

In 1958, there were 15,193 candidates registered, of whom 13,097, or 86.2%, were graduates of approved schools and 2,096, or 13.8%, were in the second group. In the 37 years recorded in this table, 375,756 candidates were registered, including 337,843 (89.9%) who were graduates of medical schools in the approved group and 37,913 (10.1%) who were other graduates.

TABLE 12.—*Licentiates Representing Additions to the Medical Profession Grouped in Geographical Divisions, 1958*

	Examination	Reciprocity and Endorsement	Total
New England			
Maine	20	2	22
New Hampshire	5	9	14
Vermont	6	1	7
Massachusetts	11	196	207
Rhode Island	38	6	44
Connecticut	96	80	176
Totals	176	294	470
Middle Atlantic			
New York	294	760	1,054
New Jersey	106	28	134
Pennsylvania	472	48	520
Totals	872	836	1,708
East North Central			
Ohio	401	43	444
Indiana	170	9	179
Illinois	324	63	387
Michigan	297	8	305
Wisconsin	127	5	132
Totals	1,319	128	1,447
West North Central			
Minnesota	171	12	183
Iowa	90	4	94
Missouri	262	7	269
North Dakota	6	..	6
South Dakota	7	..	7
Nebraska	109	1	110
Kansas	114	1	115
Totals	759	25	784
South Atlantic			
Delaware	5	..	5
Maryland	262	18	280
District of Columbia	6	46	52
Virginia	208	14	222
West Virginia	12	1	13
North Carolina	178	..	178
South Carolina	59	1	60
Georgia	232	5	237
Florida	137	..	137
Totals	1,099	85	1,184
East South Central			
Kentucky	93	9	102
Tennessee	145	3	148
Alabama	73	3	76
Mississippi	120	..	120
Totals	431	15	446
West South Central			
Arkansas	86	..	86
Louisiana	229	..	229
Oklahoma	81	3	84
Texas	346	3	349
Totals	742	6	748
Mountain			
Montana	1	1	2
Idaho	3	1	4
Wyoming	4	..	4
Colorado	73	8	81
New Mexico	3	..	3
Arizona	7	6	13
Utah	15	4	19
Nevada	2	1	3
Totals	108	21	129
Pacific			
Alaska	4	..	4
Washington	59	18	77
Oregon	27	..	27
California	492	190	682
Totals	582	208	790
Territories and Possessions			
Canal Zone	..	4	4
Guam	..	2	2
Hawaii	9	7	16
Puerto Rico	57	22	79
Virgin Islands	1	1	2
Totals	67	36	103
Grand Totals	6,155	1,654	7,809

1959
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Graduates of Unapproved Medical Schools Registered, 1953-1958

Recorded in table 16 are data regarding graduates of institutions that have not been approved by the Council on Medical Education and Hospitals of the American Medical Association. Figures are given for those licensed after written examination and those licensed by endorsement of credentials. The table also includes a column combining the figures for these two groups. They represent graduates of five unapproved medical schools, all but one of which are now extinct. The latter institution has obtained the status of an approved school. There were 240 graduates of unapproved medical schools registered from 1953 to 1958 inclusive, 79 by examination and 161 by endorsement of credentials. California, Florida, New York, and Texas licensed the greatest number of graduates of unapproved medical schools. Twenty-seven state boards were represented in the six-year period. In 1958, there were 32 licensed by 13 boards, 6 by examination, and 26 by reciprocity or endorsement. The numbers of such graduates appearing for licensure is steadily decreasing.

TABLE 13.—*Licentiates Representing Additions to the Medical Profession, 1935-1958*

Year	Examination	Reciprocity and Endorsement	Total
1935	5,099	411	5,510
1936	5,548	629	6,177
1937	5,812	612	6,424
1938	5,759	561	6,320
1939	5,584	460	6,044
1940	5,432	455	5,887
1941	5,241	474	5,715
1942	5,560	454	6,014
1943	5,588	372	5,960
1944	6,495	470	6,695
1945	4,979	769	5,748
1946	5,392	1,608	6,970
1947	5,273	1,617	6,890
1948	4,942	1,694	6,636
1949	4,260	1,616	5,876
1950	4,609	1,393	6,002
1951	4,985	1,288	6,273
1952	5,168	1,717	6,885
1953	5,388	1,888	7,276
1954	5,807	2,089	7,917
1955	6,211	1,526	7,737
1956	6,085	1,478	7,563
1957	5,872	1,583	7,455
1958	6,155	1,654	7,809
Totals	131,252	26,629	157,891

Graduates of Schools of Osteopathy Registered by Medical Examining Boards, 1953-1958

The number of graduates of schools of osteopathy granted the privilege of practicing medicine or surgery or both by 18 licensing boards from 1953 to 1958, inclusive, is given in table 17. There have been 1,708 such persons registered, 1,171 by examination and 537 without written examination. In 1958, 14 boards licensed osteopathic physicians to practice. Two boards licensed these graduates after examination only, and 4 licensed them only on the basis of reciprocity, while 8 boards licensed them after both methods. Following is a summary of the actions and regulations of the 18 boards providing for the licensing of osteopaths by the medical examining board.

In Colorado an osteopath receives a license to practice medicine and must meet the same requirements as for doctors of medicine. In Connecticut an osteopath registered by the osteopathic board may be licensed to practice medicine and surgery or both after examination by the medical examining board. Osteopaths in Delaware may be licensed as osteopathic physicians after successfully passing the examination of the medical board, except that the principles of osteopathy is given in the examination in place of materia medica.

The District of Columbia will permit any person engaged in the practice of osteopathy on or before Jan. 1, 1948, to file application for a license to practice osteopathy and surgery. To obtain such a license, an osteopath must pass all subjects of the medical examination and in addition must pass

TABLE 14.—*Registration of Physicians, 1904-1958*

Year	Examined	Passed	% Failed	Reciprocity or Endorsement	Total Registered
1904	7,056	5,693	19.3	1,095	6,688
1905	7,178	5,698	20.6	394	6,092
1906	8,040	6,373	20.7	1,502	7,875
1907	7,279	5,731	21.3	1,427	7,158
1908	7,775	6,089	21.7	1,284	7,373
1909	7,295	5,895	19.6	1,381	7,246
1910	7,011	5,719	18.4	1,640	7,359
1911	6,964	5,582	19.8	1,243	6,825
1912	6,980	5,467	20.5	1,273	6,740
1913	6,453	5,253	18.6	1,292	6,545
1914	5,579	4,379	21.5	1,439	5,818
1915	5,334	4,507	15.5	1,399	5,906
1916	4,878	4,151	14.9	1,353	5,504
1917	4,754	4,085	14.0	1,360	5,445
1918	3,697	3,184	13.2	1,047	4,231
1919	4,750	4,074	14.2	2,546	6,620
1920	4,786	4,062	15.8	2,558	6,620
1921	4,925	4,228	12.4	2,186	6,414
1922	4,681	3,539	12.2	2,073	5,612
1923	4,727	4,028	14.8	2,465	6,493
1924	5,302	4,756	11.8	1,923	6,679
1925	6,002	5,450	9.2	1,861	7,311
1926	5,770	5,314	7.9	1,955	7,269
1927	5,389	5,002	7.2	2,176	7,178
1928	5,456	5,050	6.7	2,228	7,278
1929	5,029	4,782	6.2	2,420	7,202
1930	5,571	5,255	5.7	2,366	7,621
1931	5,611	5,263	6.2	2,211	7,476
1932	5,675	5,247	7.6	1,886	7,133
1933	5,673	5,244	7.6	1,989	7,233
1934	6,145	5,628	8.4	2,161	7,789
1935	6,443	5,859	9.1	2,194	8,053
1936	6,918	6,224	10.0	2,773	8,997
1937	7,334	6,604	10.0	3,295	9,899
1938	7,461	6,589	11.7	2,956	9,545
1939	7,754	6,483	16.3	2,872	9,355
1940	7,936	6,291	20.7	2,866	9,157
1941	7,529	6,057	19.7	2,762	8,819
1942	7,225	6,120	15.4	2,469	8,589
1943	8,403	7,480	10.9	2,340	9,829
1944	6,817	6,011	11.8	2,586	8,607
1945	5,930	5,343	9.9	3,622	8,965
1946	7,610	6,856	9.9	9,669	16,525
1947	7,164	6,414	10.5	7,701	14,115
1948	6,624	5,934	10.8	7,565	13,499
1949	5,563	5,219	12.5	6,929	12,148
1950	6,203	5,481	11.6	6,755	12,236
1951	6,473	5,716	11.7	6,225	11,941
1952	7,028	6,229	11.3	7,016	13,245
1953	7,425	6,543	13.0	7,869	14,412
1954	8,006	7,003	12.7	8,302	15,305
1955	8,501	7,400	12.9	7,461	15,902
1956	8,342	7,179	13.9	7,421	14,600
1957	9,116	7,769	14.8	7,486	15,255
1958	8,633	7,298	15.8	7,995	15,193

subjects in the practice of osteopathy. Osteopaths are eligible for licensure also by endorsement of the certificate issued by the National Board of Osteopathic Medical Examiners.

Since 1950, in Illinois, graduates of the Chicago College of Osteopathy are examined by the medical board and may receive medical licenses. In Indiana, under an amendment to the medical practice act in 1945, osteopaths are permitted to practice medicine, surgery, and obstetrics and to administer anesthetics, antiseptics, and narcotics. Persons who were licensed in osteopathy before 1945 may obtain from the medical board a license to practice osteopathy, surgery, and obstetrics.

TABLE 15.—*Graduates of Approved Schools and Others Registered, 1922-1958*

Year	Graduates of Approved Schools		Others		
	No.	Percentage of Total	No.	Percentage of Total	Totals
1922	4,519	80.5	1,093	19.5	5,612
1923	5,196	80.8	1,237	19.2	6,433
1924	5,687	85.1	992	14.9	6,679
1925	6,314	86.4	997	13.6	7,311
1926	6,441	88.7	828	11.3	7,269
1927	6,410	89.4	768	10.6	7,178
1928	6,585	90.1	723	9.9	7,308
1929	7,003	91.0	696	9.0	7,702
1930	7,011	92.1	610	7.9	7,621
1931	6,932	92.8	544	7.2	7,476
1932	6,676	92.1	457	6.3	7,133
1933	6,774	93.7	459	6.3	7,233
1934	7,172	92.1	617	7.9	7,789
1935	7,490	91.3	693	8.5	8,053
1936	7,934	88.1	1,063	11.8	8,997
1937	8,291	85.5	1,418	14.4	9,809
1938	8,315	87.1	1,230	12.9	9,545
1939	8,067	86.2	1,298	13.8	9,365
1940	7,781	85.0	1,376	15.0	9,157
1941	7,770	87.9	1,049	11.9	8,819
1942	7,290	84.9	1,299	15.1	8,589
1943	8,040	87.9	1,189	12.2	9,929
1944	7,787	89.8	870	10.1	8,657
1945	8,233	91.8	732	8.1	8,965
1946	15,682	94.9	835	5.1	16,527
1947	13,097	93.0	1,018	7.0	14,115
1948	12,791	94.8	708	5.2	13,499
1949	11,378	93.7	770	6.3	12,148
1950	11,502	94.0	734	6.0	12,236
1951	11,027	92.3	914	7.7	11,941
1952	12,198	92.1	1,047	7.9	13,245
1953	13,189	91.5	1,223	8.5	14,412
1954	13,814	90.7	1,421	9.3	15,235
1955	13,344	89.8	1,517	10.2	14,861
1956	13,146	90.0	1,454	10.0	14,600
1957	13,330	87.4	1,925	12.1	15,255
1958	13,097	86.2	2,096	13.8	15,193
Totals	337,843	89.9	37,913	10.1	375,756

Special examination and licensure is provided by the Healing Arts Act passed in Kansas in 1957. An osteopathic physician having graduated from an approved college of osteopathy after June 1, 1950, and who holds a valid license to practice osteopathy is eligible for licensure. Any person who on Jan. 1, 1957, was licensed to practice osteopathy and who on said date maintained an office and was actively engaged in the practice of osteopathy in Kansas may, if application is made prior to July 1, 1960, take a special examination.

In Massachusetts, for the purposes of registration, the D. O. degree is considered equivalent to the M.D. degree and applicants for licensure must meet the same requirements as M.D.'s. In New Hampshire, under the provisions of the medical practice act, osteopaths are granted the right to practice medicine and surgery. The New Jersey medical practice act provides that an osteopath licensed prior to Nov. 1, 1941, who has served for a period of two years as an intern or resident surgeon in an approved osteopathic or medical hospital, has completed a postgraduate course of two years in a college of osteopathy or medicine approved by the board, or has had at least three years of practice in a hospital approved by the board, can be admitted to an examination in pharmacology, therapeutics, and surgery. If successful, he can obtain a license to practice medicine and surgery.

In New York, a licensed osteopath who is an applicant for the right to use instruments for minor surgical procedures and to use anesthetics, antiseptics, narcotics, and biological products may be granted the right to practice medicine without limitation if his credentials satisfy the Board of Regents. If not, such applicants shall be required either to pursue further study or to pass a special examination.

The Ohio Medical Practice Act was amended in 1943 to provide that all graduates from osteopathic schools applying for the right to practice in the state must meet certain educational requirements and must pass certain examinations. One of the required examinations is in surgery. Those who qualify and pass all of the examinations are then given a license to practice osteopathic medicine and surgery. Those in practice and licensed under a more limited law in effect prior to 1943 can secure a license to practice osteopathic medicine and surgery by meeting certain additional requirements, including postgraduate work and the passing of additional examinations.

In Oregon, osteopaths who meet certain requirements are granted the right to practice in the subjects covered by the medical examination, with the exception of the practice of medicine or materia medica and therapeutics. In South Dakota, osteopaths may be licensed to practice medicine, surgery, and obstetrics. This is an unrestricted license. Texas issues only one license, which is unrestricted in scope.

In Virginia, two classes of osteopaths are licensed. If a candidate takes the same examination as an M.D., substituting the practice of osteopathy for the practice of medicine, he is licensed to practice osteopathy with the use of surgery and drugs. However, if he takes an examination without the subjects of surgery and materia medica, he is licensed to practice osteopathy without the use of drugs or surgery.

The Wisconsin law, amended in 1950, provides that an osteopath, licensed in the state may obtain a license to practice medicine and surgery by completing a refresher course in materia medica and pharmacology consisting of not less than 64 hours of lecture and 60 hours of laboratory work and by passing an examination in these subjects. Osteopaths not licensed in the state may apply to take

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the same examination as physicians. If successful, they will be granted licenses to practice medicine and surgery. In Wyoming, the statutes contain no specific provision for the licensing of osteopaths. The medical practice act provides that the certificate issued to all physicians shall be deemed a license to practice medicine in all branches in which the applicant has taken an examination.

Enactment and Operation of Medical Practice Act

An attempt was made this year to obtain from each licensing board the year when the first medical practice act was enacted and the year when the four years of preprofessional college training. Since January, 1953, the minimum requirement for admission to an approved medical school has been three years of college work, with the provision that rarely and only under exceptional circumstances will an approved medical school be justified in admitting a superior student with only two years of college preparatory work.

The preprofessional requirements of medical licensing boards are indicated in table 19. Seven boards specify that no preprofessional requirement is mentioned in the medical practice act. Twenty-

TABLE 16.—*Graduates of Unapproved Medical Schools Registered 1953-1958*

	Examination							Reciprocity and Endorsement							Combined Totals
	1953	1954	1955	1956	1957	1958	Totals	1953	1954	1955	1956	1957	1958	Totals	
Arizona	..	..	..	..	..	..	..	..	1	..	..	1	..	2	2
Arkansas	..	..	..	..	..	..	..	..	..	..	..	2	1	3	3
California	..	..	..	..	..	..	..	8	10	15	2	5	11	60	60
Delaware	..	..	..	..	..	..	..	..	..	1	..	1	..	2	2
District of Columbia	..	..	..	..	..	..	..	..	..	..	1	1	1	3	3
Florida	5	8	7	4	5	1	30	..	..	..	..	..	..	..	30
Georgia	1	2	..	..	..	..	3	1	..	..	..	..	1	2	5
Idaho	..	..	..	..	..	..	..	1	..	..	..	1	..	2	2
Illinois	..	..	..	..	..	..	..	..	2	4	..	..	..	6	6
Iowa	..	..	..	..	..	..	..	1	1	..	..	..	..	2	2
Maine	..	..	1	..	..	..	1	..	..	1	..	..	..	1	2
Massachusetts	2	5	1	..	..	1	9	..	..	..	..	..	..	..	9
Michigan	..	..	..	..	..	..	..	..	1	..	1	1	1	4	4
Missouri	..	..	..	..	..	..	..	2	1	..	1	1	..	5	5
New Hampshire	..	..	..	..	..	..	..	..	..	..	1	..	..	1	1
New Jersey	3	1	..	..	..	..	4	..	..	..	4	1	..	5	9
New York	3	3	1	5	2	2	16	..	..	..	1	..	..	1	17
Ohio	..	..	3	..	..	..	3	1	3	..	..	..	..	4	7
Pennsylvania	..	..	..	..	..	2	2	1	..	1	..	..	..	2	4
South Carolina	..	..	..	..	2	..	2	..	..	..	..	..	..	..	2
South Dakota	..	..	1	..	..	..	1	..	..	..	..	..	..	..	1
Tennessee	..	..	..	..	..	..	..	1	..	..	..	..	1	1	2
Texas	..	1	..	..	..	..	1	9	7	3	8	11	4	42	42
Virginia	2	..	..	..	..	..	2	..	..	..	..	..	..	..	2
Washington	..	..	..	..	..	..	..	..	..	..	..	1	2	3	3
West Virginia	3	..	..	..	..	..	3	..	..	..	..	..	..	..	3
Wisconsin	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8
Territories and Possessions	1	2	..	..	..	..	3	..	1	..	..	..	..	1	4
Totals	20	21	14	9	9	6	79	24	36	27	20	28	26	161	240

TABLE 17.—*Graduates of Schools of Osteopathy Registered by Medical Boards, 1953-1958*

	Examination							Reciprocity and Endorsement							Combined Totals
	1953	1954	1955	1956	1957	1958	Totals	1953	1954	1955	1956	1957	1958	Totals	
Colorado	8	3	7	1	5	..	24	15	22	16	12	9	15	89	113
Connecticut	2	3	..	..	..	..	5	..	..	..	..	..	..	..	5
Delaware	1	..	2	3	1	..	7	4	1	2	..	1	1	9	16
District of Columbia	..	..	..	..	..	1	1	..	1	1	..	..	..	2	3
Illinois	..	..	14	10	2	6	32	..	..	..	11	..	..	11	43
Indiana	5	2	6	2	5	6	26	10	11	9	..	9	12	51	77
Kansas	..	..	..	..	144	16	160	..	..	..	..	..	4	4	164
Massachusetts	..	1	..	..	..	..	1	1	2	5	4	4	6	22	23
New Hampshire	..	..	..	..	1	1	2	3	1	3	1	2	1	11	13
New Jersey	11	7	8	6	9	2	43	10	18	7	28	10	45	118	161
New York	47	44	92	42	44	35	304	4	1	1	4	..	3	13	317
Ohio	64	81	73	63	66	66	413	30	13	2	13	10	3	61	474
Oregon	..	..	..	..	..	..	..	1	..	..	2	..	..	3	3
South Dakota	..	1	..	..	..	..	1	..	..	..	..	..	..	..	1
Texas	32	46	25	9	3	5	120	16	13	10	13	32	43	127	247
Virginia	..	..	..	..	..	..	..	1	1	..	..	..	..	2	2
Wisconsin	7	7	6	6	4	2	32	..	1	1	3	3	2	10	42
Wyoming	..	..	..	..	..	..	..	..	..	1	..	..	3	4	4
Totals	177	195	233	142	284	140	1,171	85	85	58	91	80	138	537	1,708

first examining board was established under the medical practice act. These data are given in table 18. Not all states were able to provide this information. It is to be hoped that this table can be presented in more complete form when next this study is made.

Preprofessional Training Requirements of Licensing Boards

In order to provide an opportunity for medical students to gain a broad educational background, the Council on Medical Education and Hospitals of the American Medical Association recommends one boards reported a three-year requirement. In others, the law specifies at least two years of college work. No board specifies in detail the number of hours that must be devoted to the subjects of the preprofessional curriculum, although 19 boards report that this training must include certain subjects, such as English, physics, chemistry, biology, and a foreign language. The candidates appearing for medical licensure are graduates of all years, and the seeming lack of conformity with accepted standards as promulgated by the Council on Medical

Education and Hospitals of the American Medical Association and the Association of American Medical Colleges is due to the fact that initiation of the current three-year minimum requirement for all candidates appearing for licensure would eliminate many graduates of earlier years. In practice, the boards in granting licensure to a graduate of an approved medical school accept the premedical training required in the year the candidate was admitted to a medical school.

TABLE 18.—*Enactment and Operation of Medical Practice Act*

State	First Medical Practice Act Enacted	First Examining Board Established Under Medical Practice Act
Alabama	1823	1877
Alaska	..	..
Arizona	1913	1913
Arkansas	..	..
California	1876	1876
Canal Zone	1911	1911
Colorado	..	..
Connecticut	1878	1878
Delaware	1865	1865
District of Columbia	1866	1866
Florida	..	1921
Georgia	1913	..
Guam	..	..
Hawaii	..	..
Idaho	..	..
Illinois	1877	1917*
Indiana	..	..
Iowa	1880	1880
Kansas	1901	1901
Kentucky	1874	1878
Louisiana	..	..
Maine	..	..
Maryland	1888	1892
Massachusetts	1894	1894
Michigan	..	..
Minnesota	1883	1883
Mississippi	1819	1819
Missouri	1903	1903
Montana	1889	1889
Nebraska	1891	1891
Nevada	1889	1889
New Hampshire	1915	1915
New Jersey	1880	1880
New Mexico	..	..
New York	1891	1891
North Carolina	1859	1859
North Dakota	1889	1889
Ohio	1896	1896
Oklahoma	1908	1908
Oregon	1889	1889
Pennsylvania	1911	1912
Puerto Rico	..	..
Rhode Island	1865	1865
South Carolina	1817	1817
South Dakota	..	..
Tennessee	1901	1901
Texas	1837	1907
Utah	1921	1921
Vermont	..	..
Virgin Islands	..	..
Virginia	..	..
Washington	1890	1890
West Virginia	1881	1915*
Wisconsin	1897	1897
Wyoming	1890	1890

* Administered by State Board of Health until date given. Not reported.

Approval of Medical Schools

Seven licensing boards maintain their own list of approved medical schools in the United States and Canada. Twenty-six boards require applicants for licensure from approved medical schools in the United States or Canada to be graduates of medical schools approved by the Council on Medical Education and Hospitals. Two boards require membership in the Association of American Medical Colleges. Twenty boards specify that schools must be approved by the Council and be in membership in the Association of American Medical Colleges. In 16 instances the requirement is specified in the medical practice act, 37 boards reported that it is a formal regulation, and 2 indicated that it was an informal policy. In actuality, all approved medical schools are both approved by the Council and in membership in the Association of American Medical Colleges.

Required Internships

One year of internship, as a prerequisite to licensure, is required by the licensing boards of 32 states, the District of Columbia, Canal Zone, Guam, Hawaii, Puerto Rico, and the Virgin Islands. Nine boards specify that the internship must be a rotating service. Rhode Island will accept a straight internship if it is a part of a three-year approved residency. New Jersey reports that a one-year rotating service, or two years of straight internship, or a two-year residency in a specialty will meet the requirement of hospital service. Postgraduate training is accepted in lieu of deficiencies in the requirement of a rotating internship in Alaska after seven years from the date of graduation from medical school. Missouri requires the internship for reciprocity applicants only. Those licensing boards that require an internship as a prerequisite for licensure are listed in table 20.

TABLE 19.—*Requirements of Preprofessional Training by Medical Licensing Boards*

Two Years or More of College		
Alabama[1]	Kentucky	Ohio
Alaska[5]	Louisiana[4]	Oklahoma[1]
Arizona[2]	Maine	Oregon
Arkansas	Maryland	Pennsylvania[4]
California[6]	Massachusetts[7]	Puerto Rico
Canal Zone	Michigan[6]	Rhode Island
Colorado[1]	Minnesota	South Carolina[6]
Connecticut[4]	Mississippi	South Dakota[6]
Delaware[5]	Missouri	Tennessee
District of Columbia	Montana	Texas
Florida[6]	Nebraska	Utah[6]
Georgia	Nevada[1]	Vermont[6]
Guam	New Hampshire	Virgin Islands[6]
Hawaii	New Jersey[5]	Virginia
Idaho	New Mexico[1]	Washington[7]
Illinois	New York[6]	West Virginia
Indiana[7]	North Carolina[6]	Wisconsin[6]
Iowa[1]	North Dakota	Wyoming[1]
Kansas		

1. Not specified by law.
2. Entrance requirement prescribed by accrediting agencies.
3. Three years for applicants matriculating after Jan. 1, 1954.
4. One year prior to 1919, two years subsequent to 1947, including courses in physics, chemistry, and biology.
5. Premedical training must include courses in physics, chemistry, biology, English, and a foreign language.
6. Three-year college requirement.
7. For all applicants courses in physics, chemistry, and biology must be included in premedical training.
8. Premedical training must include courses in English, physics, chemistry (general and organic), and biology.

Temporary and Educational Permits, Limited and Temporary Licenses, or Other Certificates Issued by State Licensing Boards

Thirty-eight boards provide for the issuance of temporary and educational permits, limited and temporary licenses, or other certificates. The terms for the issuance of such certificates vary. This limited registration may apply to hospital training, to those ineligible for licensure who seek further educational training, or for regular practice until the next regular session of the licensing board. A list of these states and information on the length of validity of this special registration are shown in table 21.

Licensure Requirements for Interns and Residents in Hospitals

In general, physicians serving internships are not required to be licensed in the state in which the hospital where they are interning is located. Indiana and Puerto Rico have such a requirement. Delaware, the District of Columbia, and New Jersey permit a service of two years without licensure, and Florida permits a three-year service before licensure. Other boards have a requirement of registration with the licensing board or a stipulation that the physician must be eligible for licensure. The states which require some form of registration for interns are listed in table 22.

Thirty-one boards require that physicians serving residencies in hospitals must be licensed or registered in the state. Twenty-three boards stipulate that registration must be in the form of a regular license or a temporary certificate for the term of the residency. Seven boards do not require licensure but stipulate some form of registration with the licensing board. The regulations of each of the licensing boards that exact some requirement of those engaged in residency training are given in table 23.

TABLE 20.—*Medical Licensing Boards Requiring One-Year Internship*

Alabama	Kansas	Pennsylvania[1, 4]
Alaska[1]	Kentucky	Puerto Rico[1]
Arizona	Louisiana[1]	Rhode Island[5]
California	Maine	South Carolina
Canal Zone	Michigan	South Dakota
Colorado	Missouri[2]	Utah
Delaware	Montana	Vermont[1]
District of Columbia	Nevada	Virgin Islands[1]
Guam	New Hampshire	Washington[1]
Hawaii	New Jersey[3]	West Virginia
Idaho	North Dakota[1]	Wisconsin
Illinois[1]	Oklahoma	Wyoming[1]
Iowa	Oregon	

1. Internship must be a rotating service.
2. For reciprocity applicants.
3. One year rotating service or two years of straight internship or two-year residency in a specialty.
4. After seven years from date of graduation from medical school, postgraduate training accepted in lieu of deficiencies in a rotating internship.
5. Straight internship accepted if part of a three-year approved residency.

TABLE 21.—*Temporary and Educational Permits, Limited and Temporary Licenses, or Other Certificates Issued by State Licensing Boards*

Alaska	Temporary permits issued while processing permanent licensure to summer cannery physicians and to physicians in the armed forces on short periods with private physicians and for locum tenens work.
Arizona	Temporary permits issued on basis of community emergency.
Arkansas	Temporary permits are granted reciprocity applicants until regular board meeting.
Connecticut	Educational permits granted to graduates of unapproved medical schools to serve in approved hospital training programs.
Delaware	Temporary emergency license upon proved emergency, one year, subject to renewal, and for locum tenens practice (2 to 4 months).
Georgia	Permit until board meets. Permits for aliens to practice in state institutions or medical schools.
Guam	Restrictive certificate to permit medical employees of federal contractors to practice in the discharge of their official duties.
Idaho	To candidates holding certificate of National Board of of Medical Examiners or licensed by written examination in another state until next meeting of board and to residents in hospitals.
Illinois	Temporary certificates for residency training for applicants who are not qualified for permanent registration. Permit issued for service in state hospitals to physicians eligible for licensure.
Indiana	Temporary license pending next examination for graduates of approved medical schools. Temporary reciprocal license for six months.
Iowa	Resident physicians licenses are issued for a period of not more than seven years for service in a hospital approved by the board.
Kansas	Temporary permit until next board meeting providing application is in proper form for license.
Kentucky	Temporary permits issued to applicants by endorsement for six-month period to serve until investigations completed and meeting of board. Limited licenses for one year, renewable for special place, purpose, and time.
Louisiana	Temporary permit is granted to physicians possessing the necessary credentials who file application for examination or reciprocity and who locate in Louisiana between the regular semiannual examination meetings of the board. Temporary permit valid until next meeting of the board.
Maine	Temporary licenses granted for residency training for one year. Must be an American citizen and a graduate of an approved medical school.
Massachusetts	Limited registration covering appointment as intern, resident, or fellow in a specific hospital or as assistant in medicine while a student in medical school.
Michigan	Temporary license for residency and postgraduate training program renewable annually not to exceed five years.
Minnesota	Limited license for duration of residency.
Mississippi	Temporary permit for practice until next board meeting pending permanent license.
Montana	In unusual circumstances only.
Nevada	Temporary permit for one year for residency training.
New Hampshire	Temporary license for five years to foreign physicians. Permanent license issued upon becoming citizen of the United States.
New Jersey	Temporary license for four months may be renewed at monthly intervals not to exceed one year.
New Mexico	Institutional permits for practice in state hospitals only. Temporary permits issued until next board meeting.
New York	Temporary certificate for two years for residency training except in state, mental and municipal hospitals.
North Carolina	Limited license issued for duration of residency.
North Dakota	Temporary permit for United States and Canadian graduates until next board examination.
Oklahoma	Temporary licenses for one year for residency training in approved hospitals.
Pennsylvania	Postgraduate certificate issued for residency training if licensed in any state or territory or the United States or Canada or hold the certificate of the National Board of Medical Examiners.
Puerto Rico	Special permit may be granted.
Rhode Island	Temporary permit for one year for interns, residents, and house officers in hospitals.
South Carolina	Temporary permits for interns and residents renewable annually not to exceed five years.
South Dakota	Temporary license issued for graduates of foreign medical schools for four years for practice in emergency medical areas for a period of four years before permanent license is issued.
Texas	Temporary permit issued until next board meeting.
Virginia	Temporary permit issued until next board meeting for reciprocity applicants.
Virgin Islands	Temporary certificates issued to military service personnel on duty and to municipal personnel until next license examination.
West Virginia	Temporary permits issued until next board meeting to qualified applicants.
Wisconsin	Temporary educational permit for graduates of foreign medical schools not recognized by board for licensure.

Schedule of Written Examination Dates and Reciprocity Meetings

The schedules of dates for written examination and meetings or oral examination for the issuance of licenses by reciprocity or by endorsement of credentials is given in table 24. In most instances, written examinations are scheduled twice annually and reciprocity meetings quarterly or as soon as the application for licensure can be processed. In those states requiring a basic science certificate for licensure, dates of the examination or reciprocity meetings are arranged to coincide closely with the examination and meeting dates of the boards of examiners in the basic sciences.

TABLE 22.—*Licensure, Registration, or Other Requirements for Interns*

Licensure	Other Requirements
Indiana	Colorado[2]
Puerto Rico	Delaware[2]
	District of Columbia[2]
	Florida[1]
	Massachusetts[3]
	New Jersey[2]
	Rhode Island[2]
	South Carolina[3]
	Texas
	Virginia[4]
	West Virginia[4]

1. Must register every six months with State Board of Health and may serve for a period of three years without licensure.
2. May serve for two years without licensure.
3. Limited registration granted.
4. Graduates of unapproved foreign medical schools must obtain permission from board.
5. Temporary permit required.
6. May serve for an aggregate period not to exceed four years; required to register with licensing board annually.

Medical Licensure Fees

Table 25 lists for each licensing board the fee charged for registration by examination and also by reciprocity or endorsement of credentials. The examination boards tend to be uniform, the majority of the boards charging a fee of $25. The fee for a license without examination varies from $5 to $200. Three states have a lower fee for those being certified on the basis of the certificate of the National Board of Medical Examiners than for candidates licensed by endorsement of state license. One state exacts the same fee as the reciprocating state fee for such a license.

Licensure on Government Credentials

Few states have provision in their medical practice act for the acceptance of credentials issued by the federal government or the armed services as a basis for licensure without examination. Nine boards —Alabama, Arizona, California, Delaware, Illinois, Pennsylvania, Texas, Utah, Vermont, and Wisconsin —have indicated that in their discretion they may accept such credentials under varying regulations.

Annual Registration

Forty boards require physicians to register their licenses annually or biennially. This requirement applies in some states whether or not the physician is engaged in practice in the state. In table 26 are listed the licensing boards that exact this requirement and the fee charged for such registration. The fee ranges from $1 to $10. Five states have a nonresident fee. Guam does not charge a fee. In Florida physicians are required to register with the state board of health, while New York, North Carolina, and West Virginia require biennial registration.

Citizenship Requirements for Permanent Licensure

Table 27 lists the United States citizenship requirements for permanent licensure by the 55 licensing boards of the United States and its territories and possessions. Eight boards have no citizenship requirement, 17 states require that the applicant declare his intention of becoming a citizen, and 30 states require full citizenship.

TABLE 23.—*Licensure, Registration, or Other Requirements for Residents*

Licensure or Temporary Registration Required	Other Requirements
Arkansas	Colorado[9]
California[1]	Delaware[15]
Connecticut[2]	District of Columbia[15]
Idaho	Florida[10]
Illinois[3]	Mississippi[1]
Indiana	New Jersey[10]
Iowa[11]	Virginia[15]
Maine[4]	West Virginia[15]
Massachusetts[5]	
Michigan[11]	
Minnesota[6]	
Nevada[4]	
New York[7]	
North Carolina[8]	
Oklahoma[4]	
Pennsylvania[8]	
Puerto Rico	
Rhode Island[4]	
South Carolina[14]	
South Dakota	
Texas	
Washington	
Wisconsin	

1. May serve one year without licensure.
2. May be required by hospitals.
3. Applicants who wish to serve residencies in Illinois hospitals and who are not eligible for permanent registration may apply for temporary certificates which are issued without examination. Also permits to practice in State hospitals to applicants qualified for examination.
4. Temporary license for one year.
5. Limited registration granted.
6. Limited license for duration of residency.
7. Temporary certificate for two years for residents, except in state mental and municipal hospitals.
8. Postgraduate certificate issued for residency training if licensed in any state or territory of the United States or Canada or hold the certificate of the National Board of Medical Examiners.
9. May serve for an aggregate period not to exceed four years. Required to register with licensing board annually.
10. Three years without licensure. Must register every six months with board of health.
11. Resident physician's licenses are issued for a period of not more than seven years for service in a hospital approved by the board.
12. Graduates of unapproved foreign medical schools must obtain permission from board.
13. May serve two years without licensure.
14. Temporary license for residency and postgraduate training renewable annually not to exceed five years.
15. Registration with licensing board required.

Registration Policies for Citizens of Canada by Licensing Boards in the United States

The licensing boards of the United States and its territories and possessions have reported that they will accept graduates of approved medical schools of Canada for licensure by examination on the same basis as graduates of approved medical schools of the United States. Table 28 records the

registration policies for citizens of Canada. Few states indicate that they will accept Canadian registration for licensure by reciprocity or endorsement. Modifications are made in the citizenship requirement for candidates from Canada. This table shows for each state whether United States citizenship is a requirement, whether the candidate must declare his intention of becoming a citizen, and if no citizenship requirement is exacted.

Licensure of Foreign-Trained Physicians

Since 1950, the Council on Medical Education and Hospitals of the American Medical Association and the Executive Council of the Association of

TABLE 24.—*Schedule for Written Examination and Issuance of Licenses by Reciprocity or Endorsement of Credentials*

	Written Examinations	Licenses by Reciprocity or Endorsement Issued
Alabama	Annually	Continuously
Alaska	On application	On application
Arizona	Quarterly	Quarterly
Arkansas	June and November	June and November
California	Quarterly	Continuously
Canal Zone	On application	On application
Colorado	Twice annually	Quarterly
Connecticut	March, July, and November	Continuously
Delaware	January and July	January and July
District of Columbia	Twice annually	Quarterly
Florida	June and November	No Reciprocity
Georgia	June and October	June and October
Guam	On application	On application
Hawaii	January and July	Continuously
Idaho	Twice annually	Twice annually
Illinois	Quarterly	Quarterly
Indiana	Annually, June	Approximately eight times annually
Iowa	Twice annually	Monthly
Kansas	January and June	January and June
Kentucky	Semiannually	Every two months
Louisiana	June and December	June and December
Maine	March, July, and November	March, July, and November
Maryland	June and December	Monthly
Massachusetts	January and July	Monthly except August
Michigan	June and October	Continuously
Minnesota	Quarterly	Quarterly
Mississippi	Annually in June	June and December
Missouri	Three times annually	Six times annually
Montana	Semiannually	Semiannually
Nebraska	Annually in June	Continuously
Nevada	Quarterly	Quarterly
New Hampshire	Twice annually	Twice annually
New Jersey	June and October	Monthly except August
New Mexico	Twice annually	Twice annually
New York	June and December	Continuously
North Carolina	Annually	Five times annually
North Dakota	January and July	January and July
Ohio	June and December	January, April, July, and October
Oklahoma	Annually	Quarterly
Oregon	January and July	Quarterly
Pennsylvania	January and July	Every six weeks
Puerto Rico	Twice annually	Continuously
Rhode Island	Quarterly	Four times annually; special meetings
South Carolina	Twice annually	Three times annually
South Dakota	Twice annually	Continuously
Tennessee	Quarterly	Continuously
Texas	Twice annually	Quarterly
Utah	Once annually	February, June, August, and November
Vermont	January and June	Continuously
Virgin Islands	Twice annually	Twice annually
Virginia	Twice annually	Twice annually
Washington	Twice annually	Twice annually
West Virginia	January and July	Quarterly
Wisconsin	January and July	Quarterly
Wyoming	Three times annually	Three times annually

American Medical Colleges have published a list of foreign medical schools whose graduates are recommended for consideration on the same basis as graduates of approved medical schools in the United States and Canada. This list has always been offered as an advisory list for the use of state licensing boards, hospitals, specialty boards, and other organizations in the United States concerned

TABLE 25.—*Medical Licensure Fees*

	Examination	Reciprocity or Endorsement
Alabama	$ 50	$ 50
Alaska	35	110
Arizona	25	100
Arkansas	50	100
California	25	100
Canal Zone	10	5
Colorado	25	50
Connecticut	35	75
Delaware	25	100
District of Columbia	25	50[a]
Florida	50	..
Georgia	20	50
Guam	50	50
Hawaii	50	50
Idaho	25	100
Illinois	75	200
Indiana	25	100
Iowa	25	50
Kansas	50	[b]
Kentucky	50	75
Louisiana	25	15
Maine	27	52
Maryland	35	100
Massachusetts	25	50
Michigan	50	100
Minnesota	25	100
Mississippi	10	50
Missouri	25	100
Montana	50	75
Nebraska	25	50
Nevada	100	200
New Hampshire	30	50
New Jersey	50	100
New Mexico	50	50
New York	40	40
North Carolina	50	100
North Dakota	50	50
Ohio	25	50
Oklahoma	25	100
Oregon	25	100[c]
Pennsylvania	25	50
Puerto Rico	30	30
Rhode Island	20	20
South Carolina	25	100
South Dakota	20	50
Tennessee	35	50[d]
Texas	50	100
Utah	25	50
Vermont	20	50
Virgin Islands	65	..
Virginia	25	100
Washington	25	50
West Virginia	25	100
Wisconsin	50	100
Wyoming	50	50

[a] Endorsement of certificate of National Board of Medical Examiners, $25.
[b] Same as reciprocating state fee for such a license.
[c] Endorsement fee, $30.
[d] Endorsement of certificate of National Board of Medical Examiners, $10.

with the evaluation of medical credentials and qualifications of graduates of foreign medical schools. These same organizations have always been advised that the list was acknowledged to be a tentative one and that the position of the Councils with respect to the foreign medical schools not listed has been that they neither approve nor disapprove of them.

In the years since the initial publication of this list, the number of graduates of foreign medical schools coming to the United States on either temporary or permanent visas has increased tremendously. The vast majority of physicians now entering this country either for further study as interns or residents or for permanent stay and medical licensure have received their medical degrees from medical schools other than those listed.

In February, 1958, the two Councils acted to withdraw the current list of foreign medical schools.

The withdrawal of this list and its accompanying recommendation is to become effective as of Jan. 1, 1960. The Councils wish to emphasize that this notice of discontinuing the listing of foreign medical schools is not intended to indicate any lowering of standards of the foreign medical schools that

TABLE 26.—*States Requiring Annual Registration*

State	Fee	State	Fee
Arizona	$ 5.00	Nebraska	$ 3.00
Alaska	10.00	Nevada	10.00
Arkansas	a	New Mexico	e
California	1.00	New York*	6.00
Colorado	b	North Carolina*	5.00
Connecticut	2.00c	North Dakota	5.00
District of Columbia	4.00	Oklahoma	5.00
Florida	1.00c	Oregon	f
Georgia	3.00	Pennsylvania	1.00
Guam	None	Rhode Island	1.00
Hawaii	5.00	South Dakota	2.00
Idaho	10.00	Tennessee	5.00
Illinois	6.00	Texas	5.00
Indiana	d	Utah	3.00
Iowa	2.00	Vermont	2.00
Kansas	5.00	Virginia	1.00
Louisiana	10.00	Washington	7.00
Minnesota	3.00	West Virginia*	2.00
Missouri	5.00	Wisconsin	3.00
Montana	5.00	Wyoming	2.50

* Biennial Registration.
a. Residents $2, nonresidents $4.
b. Residents $2, nonresidents $10.
c. Required by State Board of Health
d. Residents $5, nonresidents $10.
e. Residents $2, nonresidents $5.
f. Residents $20, nonresidents $5.

TABLE 27.—*Citizenship Requirements for Permanent Licensure*

No Requirement		
California	Guam	Virgin Islands
Canal Zone	Indiana	Washington
District of Columbia	Utah	
Declaration of Intention		
Arizona	Mississippi	Rhode Island
Connecticut	New Mexico	South Dakota
Illinois	New York	Texas
Iowa	North Dakota	Virginia
Maryland	Oregon	Wisconsin
Massachusetts	Pennsylvania	
Full Citizenship		
Alabama	Kentucky	New Jersey
Alaska	Louisiana	North Carolina
Arkansas	Maine	Ohio
Colorado	Michigan	Oklahoma
Delaware	Minnesota	Puerto Rico
Florida	Missouri	South Carolina
Georgia	Montana	Tennessee
Hawaii	Nebraska	Vermont
Idaho	Nevada	West Virginia
Kansas	New Hampshire	Wyoming

TABLE 28.—*Registration Policies for Citizens of Canada by Licensing Boards in the United States*

	Graduates of Approved Canadian Medical Schools Considered for Licensure by Examination on Same Basis as Graduates of Approved Medical Schools in United States	Graduates of Approved Canadian Medical Schools Presenting Canadian Registration Acceptable for Licensure by Reciprocity or Endorsement	Graduates of Medical Schools Outside of United States and Canada Presenting Canadian Registration Accepted for Licensure by Reciprocity or Endorsement on Such Credentials	United States Citizenship Requirement for Candidates from Canada		
				Full Citizenship	Declaration of Intention	Not Required
Alabama	x	..	..	..	..	x
Alaska	x	..	..	x	..	..
Arizona	x	..	..	..	x	..
Arkansas	x	..	..	x	..	..
California	x	..	..	..	..	x
Canal Zone	x	x	x	..	..	x
Colorado	x	..	..	x	..	..
Connecticut	x	..	..	..	x	..
Delaware	x	..	..	x	..	..
District of Columbia	x	..	..	..	..	x
Florida	x	..	..	x	..	..
Georgia	x	..	..	x	..	..
Guam	x	..	..	..	..	x
Hawaii	x	..	..	..	x	..
Idaho	x	..	..	x	..	..
Illinois	x	..	..	..	x	..
Indiana	x	..	..	..	..	x
Iowa	x	x	..	x	..	..
Kansas	x	..	..	x	..	..
Kentucky	x	..	..	x	..	..
Louisiana	x	..	..	..	x	..
Maine	x	..	..	..	..	x
Maryland	x	..	..	..	..	x
Massachusetts	x	..	..	..	x	..
Michigan	x	..	..	..	x[1]	..
Minnesota	x	..	..	..	..	x
Mississippi	x	x	..	..	..	x
Missouri	x	..	..	..	x[2]	x
Montana	x	..	..	..	x	..
Nebraska	x	..	..	x	..	..
Nevada	x	..	..	..	x	..
New Hampshire	x	x	x	..	..	x
New Jersey	x	..	..	x	..	..
New Mexico	x	..	..	..	x	..
New York	x	..	..	..	x	..
North Carolina	x	..	..	..	x[1]	..
North Dakota	x	..	..	..	x[1]	..
Ohio	x	..	..	..	x	..
Oklahoma	x	..	..	x	..	..
Oregon	x	..	..	..	x	..
Pennsylvania	x	..	..	..	x	..
Puerto Rico	x	..	..	x	..	..
Rhode Island	x	..	..	..	x	..
South Carolina	x	..	..	x	..	..
South Dakota	x	..	..	..	x	..
Tennessee	x	..	..	x	..	..
Texas	x	..	..	..	x	..
Utah	x	..	..	..	..	x
Vermont	x	x	..	..	..	x
Virgin Islands	x	-	..	..	..	x
Virginia	x	..	..	..	..	x[1]
Washington	x	x	..	..	..	x
West Virginia	x	..	..	x	..	..
Wisconsin	x	..	..	..	x	..
Wyoming	x	x	..	x	..	..

x Implies yes.
1. Issued temporary license renewable for five years or until full citizenship is obtained.
2. Internship completed in United States required.

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TABLE 29.—*Status of Requirements for Medical Licensure for Physicians Trained in Foreign Countries Other than Canada**

	Written Examination Required	Admitted Also on Reciprocal or Endorsement Basis	Citizenship	Basic Science Certificate	Internship in United States	Recognition Limited to Graduates of Schools Accepted by A. M. A. and A. A. M. C.	Required to Pass Examination of Educational Council for Foreign Medical Graduates	Additional Requirements	Examination Fee, Dollars
Alabama	X	..	X	X	X	..	X	X	10
Alaska	X	X	X	X	X	X	..	..	25
Arizona	X	..	D	X	X	..	X	..	25
Arkansas	Not Accepted								
California	X	..	..	..	X	..	..	X	25
Canal Zone	Not Accepted								
Colorado	X	..	X	X	X	X	..	X	25
Connecticut	X	..	D	X	..	X	X	X	35
Delaware	X	X	X	..	X	X	X	X	25
District of Columbia	X	X	..	X	X	X	..	..	25
Florida	X	..	X	X	..	..	X	..	50
Georgia	X	X	X	..	..	X	..	..	50
Guam	X	X	..	..	X	..	..	..	50
Hawaii	X	X	X	..	X	X	..	X	50
Idaho	Not Accepted								
Illinois	X	..	D	..	X	..	..	X	50
Indiana	X	..	..	..	..	..	..	X	25
Iowa	X	..	D	X	X	X	..	X	25
Kansas	X	X	X	X	X	..	..	X	50
Kentucky	X	X	..	..	X	..	..	X	50
Louisiana	Not Accepted								
Maine	X	..	X	..	X	..	X	..	27
Maryland	X	..	D	..	X	..	X	X	35
Massachusetts	X	..	D	..	..	..	X	X	25
Michigan	X	..	X	X	X	..	..	X	50
Minnesota	X	..	X	X	X	X	X	X	25
Mississippi	X	..	D	..	..	X	X	..	10
Missouri	X	..	X	..	X	..	X	..	25
Montana	X	X	X	..	X	..	..	..	50
Nebraska	X	..	X	X	..	..	X	..	25
Nevada	Not Accepted								
New Hampshire	X	X	X	..	X	..	X	X	20
New Jersey	X	X	X	..	X	..	X	X	50
New Mexico	X	..	D	X	..	X	X	..	50
New York	X	..	D	..	..	..	..	X	60
North Carolina	X	..	X	..	X	X	X	X	50
North Dakota	X	..	D	..	X	..	..	X	50
Ohio	X	..	X	..	..	..	X	X	25
Oklahoma	Not Accepted								
Oregon	X	..	D	X	X	..	..	X	50
Pennsylvania	X	..	D	..	X	..	X	X	25
Puerto Rico	Not Accepted								
Rhode Island	X	..	D	X	X	X	X	X	25
South Carolina	Not Accepted								
South Dakota	X	..	D	X	X	..	X	X	20
Tennessee	X	X	X	X	..	..	..	X	25
Texas	X	..	D	X	..	X	X	..	50
Utah	Not Accepted								
Vermont	X	..	X	..	X	..	X	X	20
Virgin Islands	X	..	..	..	X	X	..	X	60
Virginia	X	..	D	..	X	..	..	X	25
Washington	X	X	..	X	X	X	..	..	25
West Virginia	X	..	X	X	X	..	X	X	25
Wisconsin	X	..	D	X	X	..	..	X	75
Wyoming	Not Accepted								

This summary should be supplemented by direct communication with the secretary of the licensing board of the state in which the physician is interested.

* See separate table applicable to Canadian citizens.

** The withdrawal of the listing of foreign medical schools by the American Medical Association and the Association of American Medical Colleges, and its accompanying recommendation is to become effective as of January 1, 1960.

x Implies yes.

D Declaration of intention to become citizen of the United States.

Additional Requirements

Alabama. Candidate is eligible if he is certified by the National Board of Medical Examiners and approved.

California. Two-year internship in an approved hospital in the United States, one of said years being in California.

Colorado. Credentials must be submitted in original form and accompanied by translation and will be directly verified or documents should bear evidence of being visaed by the U. S. Consul in the country wherein the school of graduation is or was located.

Connecticut. Graduates of foreign medical schools not on accepted listing must be qualified by E. C. F. M. G. before serving as interns or residents. Minimum of three years of hospital training in approved hospital in United States or Canada required, one year of which must be in general medicine.

Delaware. Residence for one year required.

Georgia. Reciprocity applicants may furnish certification of passing examination of E. C. F. M. G. in lieu of acceptable medical school, and applicants for examination are given consideration on an individual basis.

Hawaii. Diplomates of National Board eligible on reciprocity basis.

Illinois. Limited license for practice in hospitals maintained by the state.

Indiana. Graduation from medical school approved by Indiana board, plus repetition of senior year in approved medical school in United States or two years' postgraduate work in approved hospital in the United States. Postgraduate work must be obtained in states other than Indiana.

Iowa. Requirements include (1) medical diploma, (2) three years of residency training approved by the board, and (3) recommendation of the Educational Council of Foreign Medical Graduates.

Kansas. Certificate from medical college specifying in detail the physical equipment of the school, the curriculum, current catalog showing courses of study, and certificate that the college is recognized by authorities of such foreign country as qualifying its graduates for practice therein; diploma from such college; certificate of licensure in the country where graduated; one year of internship in the United States or certificates from reputable practitioners or teachers licensed in United States who graduated from same school.

Kentucky. Applicant required to complete at least five years' training in the United States in an institution approved by the board and to have successfully passed examination of National Board of Medical Examiners.

Maryland. Graduates of recommended foreign medical schools may be admitted to examination after completion of one year of internship or residency in an approved hospital in the United States if their credentials are approved and have submitted at least two letters from the hospital authorities recommending them as to professional ability and moral character.

Graduates of foreign medical schools not on the recommended list who obtained the medical degree after Jan. 1, 1940, are not accepted unless they have served at least three years as an intern or resident in approved hospitals in the United States and have submitted at least two letters from each hospital recommending them as to their professional ability and moral character.

Graduates of foreign medical schools, before Jan. 1, 1940, whose schools were known to have had acceptable standards at the time of graduation may be considered if their credentials and professional experience in the United States are acceptable.

Ability to write and speak the English language clearly is a primary requisite.

Massachusetts. Must furnish documentary evidence that education is equivalent to that of graduates of United States medical schools and shall be required to take examination of National Board of Medical Examiners who shall certify that the applicant has successfully passed said examination.

Minnesota. Two-year internship is required.

New Hampshire. Diplomates of National Board of Medical Examiners eligible on endorsement basis. Temporary license valid until citizenship is completed may be given. Considered on an individual basis.

New Jersey. Internship completed in foreign countries after July 1, 1954, not acceptable. Acceptance limited to schools recognized by the board. Considered on an individual basis. After Jan. 1, 1955, must have minimum of three years' training in a hospital approved by the board.

North Carolina. At the discretion of the Board.

Ohio. Graduates of schools of Continental Europe after 1943 are eligible if on accepted list. If not licensed in a foreign country must have one year in hospital in the United States; if not on accepted list, two years of training in an approved hospital in the United States. Considered on an individual basis.

Oregon. The board at its discretion may utilize the facilities of the Educational Council for Foreign Medical Graduates. Must show evidence of internship and/or residency of not less than two years in not more than two hospitals approved for such training. Less than an unqualified recommendation from the heads of these training programs shall preclude further consideration.

Pennsylvania. Graduates of foreign medical schools, with the exception of those who matriculated before Oct. 1, 1957 in the schools approved by the board or those licensed by examination in another state, are required to pass the examinations of the Educational Council for Foreign Medical Graduates.

Rhode Island. E. C. F. M. G. certification required for those who begin to qualify after Jan. 1, 1958.

South Dakota. Applicant required to practice in an emergency area for four years under a temporary license and reappear before the board for permanent licensure. After July 1, 1955, only those cleared through 1RO1 will be eligible.

Tennessee. All applicants must be from medical schools whose curriculum equals that of the University of Tennessee. Each applicant considered on an individual basis.

Vermont. Certification by Educational Council for Foreign Medical Graduates or National Board of Medical Examiners required.

Virgin Islands. Residence of six months required.

Virginia. Applicant must be licensed to practice medicine and surgery in country in which school of graduation is located or must have completed the course of study and passed examinations equivalent to those required for a diploma or license conferring such full right to practice. Two years of internship in approved hospital in the United States or Canada within the past five years prior to application or one year of study in an approved medical school in lieu of one year of the internship. If citizenship is not acquired within seven years after licensure, the license automatically becomes void.

West Virginia. Applicant must be resident of the state for three years preceding application and recommended by local society. Certification by Educational Council for Foreign Medical Graduates considered.

Wisconsin. 1953 Legislature established One Year Temporary Educational Permit, which authorizes graduates of unapproved foreign schools to obtain residency training in approved hospitals. May be renewed for two additional years. Educational Council for Foreign Medical Graduates certification accepted as part of evaluation procedure.

Marginal Number		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18	
Marginal Number	SCHOOL	Alabama		Alaska		Arizona		California		Colorado		Connecticut		Delaware		District of Columbia		Florida		Georgia		Illinois		Indiana		Iowa		Kansas		Louisiana		Maine		Maryland		Massachusetts	
		P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F
	ARGENTINA																																		
1	Universidad Nacional de Buenos Aires Facultad de Ciencias Medicas											1	0									3	3									3	1		
2	Universidad Nacional de Cordoba Facultad de Ciencias Medicas											0	1																			0	1		
3	Universidad Nacional del Litoral Facultad de Ciencias Medicas, Rosario																																	0	1
4	Universidad Nacional de La Plata							1	0																										
	AUSTRALIA																																		
5	University of Adelaide Faculty of Medicine																																		
6	University of Melbourne Faculty of Medicine																																		
7	University of Sydney Medical School																																	0	1
8	University of Queensland Medical School, Brisbane																																	0	1
	AUSTRIA																																		
9	Karl-Franzens Universitat, Medizinische Fakultat, Graz											1	1									11	7									0	1		
10	Leopold Franzens Universitat, Medizinische Fakultat, Innsbruck							1	0			1	0									3	6							1	0	2	1		
11	Medizinische Fakultat der Universitat, Wien					1	0	1	2			3	0			3	0					1	2												
	BELGIUM																																		
12	Universite Libre de Bruxelles Faculte de Medecine											1	0									1	0							1	0	1	0		
13	Universiteit Gent Faculteit der Geneeskunde also Universite de Gand Faculte de Medecine											2	0																						
14	Universite de Liege Faculte de Medecine											1	0																	1	0				
15	Universite Catholique de Louvain Faculte de Medecine											3	1			1	0					1	2									1	0		
	BOLIVIA																																		
16	Universidad de San Simon Facultad de Medicina, Cochabamba							0	1																										
	BRAZIL																																		
17	Faculdade de Medicine Cirurgia e Pharmacia, Bahia																																	0	1
18	Universidade do Brazil Faculdade de Medicine, Cirurgia e Pharmacia, Rio de Janeiro											0	1																						
19	Universidade de Sao Paulo Faculdade de Medicine, Sao Paulo																																		
20	Universidade de Parana Faculdade de Medicine, Curitiba																																	0	1
	BULGARIA																																		
21	University of Sofia Faculty of Medicine																					1	0												
	CHILE																																		
22	Universidad de Chile, Facultad de Ciencias Medicas, Santiago											0	1									1	0												
	CHINA																																		
23	University of Hongkong Faculty of Medicine																																	1	0
24	China Union Medical College, Peiping																																		
25	Pennsylvania Medical School, Medical Department of St. John's University, Shanghai							1	0			1	1									0	1									1	0		
26	Cheeloo University School of Medicine, Foochow																																	1	0
27	Hackett Medical College for Women, Canton																																		
28	Woman's Christian Medical College, Shanghai																																		
29	National College of Medicine of Shanghai																																		
30	West China Union University School of Medicine, Chengtu, Szechwan							3	0													0	2											0	1
31	Army Medical College, Peking, Chihli							1	0																										
32	Chinese Medical College, Canton																																	1	0
33	Dr. Sun Yat-Sen Medical College Lingnan University, Canton							0	1			1	1																			0	1	3	0
34	Aurora University French School of Medicine, Shanghai							0	1																										
35	Military Medical College, Nanking							0	1																										
36	National Central University College of Medicine, Nanking							1	0																									0	
37	Tung Nan Medical College, Shanghai																															0	1		
38	National Kiangsu Medical College, Chenkiang, Kiangsu							0	1																										
39	National Kweiyang Medical College, Kweiyang, Kweichow							1	0																										
40	Fukien Provincial Medical College, Foochow, Fukien							1	0																										
41	Kwong Hua Medical College, Canton, Kwangtung																																	1	0
42	Hopeh Provincial Medical College, Paoting																																		
43	Hsiang Ya Medical College, Changsha																																		
	COLOMBIA																																		
44	Universidad Nacional Facultad de Medicina, Bogota							1	2													0	1									1	0		
45	Universidad de Cartagena Facultad de Medicina, Cartagena																																		
46	Universidad de Antioquia Facultad de Medicina y Ciencias Naturales, Medellin																																	1	0
47	Universidad Catolica Facultad de Medicina de la Pontificia, Bogota													1	0							1	0												
	CUBA																																		
48	Universidad de la Habana Facultad de Medicina y Farmacia							2	2			1	0					5	8	5	0	25	33									2	5	2	
	CZECHOSLOVAKIA																																		
49	Deutsche Universitat Medizinische Fakultat, Prag											1	0									1	3									1	0		
50	Universita Karlova Fakulta Lekarska, Praha											0	2									0	2												
51	Masarykova Universita Fakulta Lekarska, Brno																					1	2												
	DENMARK																																		
52	Kobenhavns Universitet Laegevidenskabelige Fakultet											0	1																					2	
	DOMINICAN REPUBLIC																																		
53	Universidad de Santo Domingo Facultad de Medicina							1	1			1	0									2	19												
	ECUADOR																																		
54	Universidad Central Facultad de Ciencias Medicas, Quito							1	0													1	5									1	0		
55	Universidad de Guayaquil Facultad de Medicina, Guayaquil							1	1																										
	EGYPT																																		
56	Egyptian University Faculty of Medicine, Cairo																																		
57	Fouad First University Faculty of Medicine, Cairo							1	0																										
58	Alexandria University Faculty of Medicine, Alexandria											0	1									1	0												
	Marginal Number	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18	

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19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	
Michigan	Minnesota	Mississippi	Missouri	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oregon	Pennsylvania	Rhode Island	South Dakota	Texas	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Hawaii and Puerto Rico	Totals	Examined—Passed	Examined—Failed	% Failed	Number of Boards Examined By	Matrimal Number
P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F						
																		0 1						12	7	5	41.7	4	1
																								2	0	2	100.0	2	2
																	0 1							2	0	2	100.0	2	3
																								1	1	0	0.0	1	4
												1 0					0 1							2	1	1	50.0	2	5
							2 0		1 1															4	3	1	25.0	2	6
									2 0															3	2	1	33.3	2	7
																								1	0	1	100.0	1	8
							3 3		0 3			3 4		1 0 1 0										42	23	19	45.2	3	9
2 0					1 0		2 2		1 1			2 4		3 0				1 0						32	18	14	43.8	12	10
							0 1		6 12		0 1	1 4						0 1		1 0				40	17	23	57.5	11	11
																		1 0						5	5	0	0.0	5	12
																								2	2	0	0.0	1	13
																		1 0						2	2	0	0.0	1	14
									2 0			1 0							0 1						13	9	4	30.8	7	15
							1 0																	2	1	1	50.0	2	16
																	0 1							2	0	2	100.0	2	17
									1 1															3	1	2	66.7	2	18
	1 0																							1	1	0	0.0	1	19
																								1	0	1	100.0	1	20
												0 2												3	1	2	66.7	2	21
																					1 0			3	2	1	33.3	3	22
																					1 0			1	1	0	0.0	1	23
																								3	2	1	33.3	3	24
							1 0		3 0					2 0				1 1						13	10	3	23.1	8	25
																		1 0						2	2	0	0.0	2	26
												0 1												1	0	1	100.0	1	27
																								4	3	1	25.0	3	28
1 0							1 0		1 1															5	4	1	20.0	5	29
1 0							1 0		1 0								1 0	0 1											
																		0 1						11	3	4	57.1	4	30
																								1	1	0	0.0	1	31
																								1	1	0	0.0	1	32
							1 0							1 0				0 1						10	6	4	40.0	7	33
									1 1															3	1	2	66.7	2	34
																								1	0	1	100.0	1	35
																								3	1	2	66.7	2	36
																								1	0	1	100.0	1	37
																			0 1					2	0	2	100.0	2	38
																								1	1	0	0.0	1	39
																								1	1	0	0.0	1	40
																								1	1	0	0.0	1	41
												0 1												1	0	1	100.0	1	42
									1 0															1	1	0	0.0	1	43
	1 0								0 1			0 1												8	3	5	62.5	6	44
																		0 1						2	1	1	50.0	2	45
																								1	1	0	0.0	1	46
																								1	1	0	0.0	1	47
							2 0		9 1			2 5						2 1	2 6		1 0		1 1	125	61	64	51.2	14	48
									3 7															16	6	10	62.5	4	49
1 0							2 1		1 5			0 1												15	4	11	73.3	6	50
									1 0															4	2	2	50.0	2	51
																		1 1	0 1				1 0	9	6	3	33.3	6	52
									2 0																				
									0 1						1 0			2 0					1 1 2	44	21	23	52.3	7	53
							1 0					0 2												11	4	7	63.6	3	54
																								2	1	1	50.0	2	55
																					1 0			1	1	0	0.0	1	56
																								1	1	0	0.0	1	57
																		1 0						3	2	1	33.3	2	58
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	

Marginal Number	SCHOOL	Alabama	Alaska	Arizona	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Illinois	Indiana	Iowa	Kansas	Louisiana	Maine	Maryland	Massachusetts
		P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F
	EL SALVADOR																		
59	Universidad de El Salvador Facultad de Medicina, San Salvador											0 1							
	ENGLAND																		
60	University of Birmingham Faculty of Medicine								1 0									1 0	
61	University of Bristol Faculty of Medicine				2 0		0 1										1 0		
62	University of Cambridge Faculty of Medicine				1 0								1 0			1 0			
63	University of Durham Medical School, Kings College, Newcastle-upon-Tyne				1 0		0 1												
64	University of Leeds School of Medicine				1 0								1 0						
65	University of Liverpool Medical School	1 0			1 0													1 0	
66	University of London Faculty of Medicine, London				3 0		2 1 1 0						1 0 1 0						1 0
67	University of Manchester Faculty of Medicine				1 0														
68	College of Physicians of London, Member of the Royal College of Surgeons, England						1 0					1 0							
	ESTONIA																		
69	Tartu Ulikooli-Faculte de Medecine de l'Universite de Tartu											0 1							
	FRANCE																		
70	Universite de Lyon Faculte de Medecine et de Pharmacie											0 1							
71	Universite de Montpellier Faculte de Medecine																	0 1	
72	Universite de Nancy Faculte de Medecine																1 0		
73	Universite de Paris Faculte de Medecine	1 0										2 3						4 1	
74	Universite de Toulouse Faculte de Medecine et de Pharmacie											1 0							
75	Universite de Strasbourg Faculte de Medecine				1 0		0 1					0 1							
	GERMANY																		
76	Friedrich-Wilhelms Universitat Medizinische Fakultat, Berlin				0 1		0 1					1 3							0 1
77	Rheinische Friedrich-Wilhelms Universitat Medizinische Fakultat, Bonn				0 1		1 1					2 3						1 0	
78	Friedrich-Alexanders Universitat Medizinische Fakultat, Erlangen				1 0		3 1 0 1					3 4					1 0	2 1	0
79	Albert-Ludwigs Universitat Medizinische Fakultat, Freiburg	1 0 1 0					2 0					1 1						1 0	
80	Hessische Ludwigs Universitat Medizinische Fakultat, Giessen																		
81	Georg August Universitat Medizinische Fakultat, Gottingen				1 1							3 1							0 1
82	Ernst-Moritz-Arndt Universitat Greifswald Medizinische Fakultat, Greifswald											1 1							
83	Universitat Heidelberg Medizinische Fakultat, Baden				3 1		2 0					1 4						3 1	0 1
84	Thuringische Landesuniversitat Medizinische Fakultat, Jena											0 1							
85	Christian-Albrechts Universitat Medizinische Fakultat, Kiel				0 1		1 0					1 2					0 1		
86	Albertus Universitat Medizinische Fakultat, Konigsberg																		
87	Universitat Leipzig Medizinische Fakultat											0 1							
88	Philipps Universitat Medizinische Fakultat, Marburg						1 0					3 1					1 0	1 0	
89	Ludwig-Maximilians Universitat Medizinische Fakultat, Munchen				5 0		2 0					4 12					3 2	7 1	
90	Eberhard-Karls Universitat Medizinische Fakultat, Tubingen						0 1					3 4						2 0	
91	Julius-Maximilians Universitat Medizinische Fakultat, Wurzburg				1 0							0 2						2 0	0 1
92	Hamburgische Universitat Medizinische Fakultat, Hamburg				3 1		1 0				1 0	0 3						1 0	
93	Universitat Koln Medizinische Fakultat, Koln				1 0							1 1						1 0	0 1
94	Johann Wolfgang Goethe Universitat Medizinische Fakultat, Frankfurt-am-Main						1 0					3 2						2 1	
95	Westfalische Wilhelms Universitat Medizinische Fakultat, Munster											0 1							
96	Medizinische Akademie Dusseldorf, Dusseldorf				2 0		1 0					2 0							
97	Humboldt University Medical School, Berlin																		
98	Medizinische Fakultat der Johannes Gutenberg Universitat, Mainz				1 0		1 0					1 0							
99	Freien Universitat Medizinische Fakultat, Berlin											1 0							
100	Schlesische Friedrichs-Wilhelms Universitat Medizinische Fakultat, Breslau											0 1							
101	Universitat Rostock, Medizinische Fakultat, Rostock																		
	GREECE																		
102	National University of Athens School of Medicine				4 2		2 4					10 20					3 0	5 5	0 3
103	Aristotle University of Salonica Faculty of Medicine, Salonika				1 0		1 1											0 2	
	HAITI																		
104	Ecole Nationale de Medecine et de Pharmacie, Port-au-Prince											1 3							
	HUNGARY																		
105	Magyar Kiralyi Pazmany Petrus Tudomanyegyetem Orvosi Fakultasa, Budapest			1 0	0 4		2 0		1 0			6 7						0 1	1 0
106	Magyar Kiralyi Ferenc Jozef Tudomanyegyetem Orvostudomanyi Kara, Szeged				0 1							1 1							
107	Magyar Kiralyi Erzsebet Tudomanyegyetem Orvostudomanyi, Pecs				1 2							0 1							
108	Magyar Kiralyi Tisza-Istvan Tudomanyegyetem Orvosi Fakultasa, Debrecen																		
	INDIA																		
109	University of Bombay				1 0													2 0	0 1
110	University of Calcutta						1 0					0 1 1 0							
111	University of Madras Medical College						1 0												
112	University of Uthal Medical College, Cutack						0 1											1 0	
113	Medical College of Agra																		
	IRAN																		
114	Madressch Teb, Teheran						1 2					2 2						6 2	0 2
	IRAQ																		
115	Royal Iraq Medical College, Bagdad				0 1													2 0	1 0
	IRELAND																		
116	Queen's University Faculty of Medicine, Belfast						2 0			1 0									
117	National University of Ireland				5 2		20 7 0 1			1 0		1 1						1 1	1 2
118	University of Dublin School of Physic, Trinity College, Dublin						3 0					2 1						1 0	0 1
119	Schools of Surgery, Royal College of Surgeons in Ireland, Dublin																		
	Marginal Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

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19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	
Michigan	Minnesota	Mississippi	Missouri	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oregon	Pennsylvania	Rhode Island	South Dakota	Texas	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Hawaii and Puerto Rico	Totals	Examined—Passed	Examined—Failed	% Failed	Number of Boards Examined By	Marginal Number
P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F						
																	1 0							2	1	1	50.0	2	59
									1 0									1 1						5	4	1	20.0	4	60
							1 0		3 0										1 0					4	3	1	25.0	3	61
																								8	8	0	0.0	6	62
									1 1															4	2	2	50.0	3	63
									1 0									1 1						5	4	1	20.0	4	64
									2 1					2 0			1 0							9	8	1	11.1	6	65
									13 1	0 1				1 0				1 0			1 0			39	27	3	10.0	11	66
									2 0									0 1						4	3	1	25.0	3	67
									1 2								1 0	2 1	2 0					11	8	3	27.3	6	68
									3 4															8	3	5	62.5	2	69
							1 0																5 0	7	6	1	100.0	1	70
												0 1												2	1	1	50.0	2	71
1 0							2 0		8 8		1 0	2 0		1 0			0 1	1 0					1 1	38	24	14	36.8	12	72
																								1	1	0	0.0	1	74
									1 0															4	2	2	50.0	4	75
1 0									3 6			1 0						0 1	1 0					20	7	13	65.0	9	76
												1 0				1 0		2 0						13	8	5	38.7	7	77
1 0	1 0						4 0		4 3			2 4						2 0						28	23	15	39.5	13	78
												1 0						1 0						9	8	1	11.1	7	79
																						1 0		1	1	0	0.0	1	80
1 0	1 0		0 1				1 1					0 1						0 2						15	7	8	53.3	9	81
	1 0	1 0					2 0		4 5			7 2		1 0	1 0			4 2						46	30	16	34.8	13	82
												0 1												2	0	2	100.0	2	84
1 0																		1 0			1 0			9	5	4	44.4	7	85
												0 1			1 0									2	0	2	100.0	2	86
									1 1															3	1	2	66.7	2	87
							1 0		1 0								1 0	1 1						12	10	2	16.7	8	88
3 0	2 0						8 1		2 4			4 2			2 0			3 3						55	45	20	40.0	12	89
3 0							1 0					1 2						2 0						19	12	7	36.8	7	90
1 0	1 0											0 1			1 0		1 0	1 1	1 0					14	9	5	35.7	11	91
							1 0		2 1			5 2			2 0		2 0							25	18	7	28.0	10	92
									1 0			0 1													7	4	3	42.9	6	93
							1 0		1 2	0 1		1 1						3 3					1 0	23	13	10	43.5	8	94
									1 0			1 1						1 0						5	3	2	40.0	4	95
							1 0		0 1								1 0	1 1						10	7	3	30.0	7	96
																		1 0		1 0	1 0			3	3	0	0.0	3	97
																		1 1						5	4	1	20.0	4	98
																		1 0						2	2	0	0.0	2	99
									0 1															1	0	1	100.0	1	100
																								1	0	1	100.0	1	101
							1 1		9 5			0 2		1 0	2 0			3 6			1 0			89	41	48	53.9	13	102
1 0							1 0											2 0						9	6	3	33.3	6	103
							1 0											1 0						6	3	3	50.0	3	104
1 0	1 0						1 0		7 13			0 5			2 0			1 1						55	24	31	56.7	14	105
							2 0		1 1			1 1		1 0			2 0							12	8	4	33.3	7	106
									1 3			0 1												9	2	7	77.8	4	107
									0 3															3	0	3	100.0	1	108
																		0 1						5	3	2	40.0	4	109
																		1 0						4	3	1	25.0	4	110
																								1	1	0	0.0	1	111
																								2	1	1	50.0	2	112
																		0 1						1	0	1	100.0	1	113
	1 0						0 1		6 5			0 1			2 0			1 1	1 2					28	20	18	47.4	11	114
							1 0																	5	4	1	20.0	4	115
	1 0								4 0	0 1								3 2						14	11	3	21.4	6	116
	1 0						1 0		3 0			1 0					1 0	1 0						51	37	14	27.5	12	117
																								8	6	2	25.0	4	118
																		1 0						1	1	0	0.0	1	119
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	

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Marginal Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Marginal Number	SCHOOL	Alabama	Alaska	Arizona	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Illinois	Indiana	Iowa	Kansas	Louisiana	Maine	Maryland	Massachusetts
		P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F
	IRELAND—Continued																		
120	Licentiate of the Royal College of Physicians of Ireland, Licentiate of the Royal College of Surgeons in Ireland				2 1		1 1					3 3					2 1	1 0	1 1
121	Licentiate of the Apothecaries' Hall, Dublin				0 1		2 0		1 0			1 1							2 0
	ISRAEL																		
122	Hadassah Medical School, Hebrew University, Jerusalem											1 0						1 0	
	ITALY																		
123	Universita degli Studi di Bologna, Facolta di Medicina e Chirurgia				0 1		1 0					0 1							0 1
124	Universita degli Studi di Milano, Facolta di Medicina e Chirurgia				0 1		2 0		1 0			1 1					2 1	1 0	1 1
125	Universita degli Studi di Catania, Facolta di Medicina e Chirurgia				0 1												1 1	1 0	
126	Universita degli Studi di Firenze, Facolta di Medicina e Chirurgia											0 1						2 0	0 1
127	Universita degli Studi di Genova, Facolta di Medicina e Chirurgia				1 0		1 0					0 1						1 0	1 0
128	Universita degli Studi di Messina, Facolta di Medicina e Chirurgia																	2 1	
129	Universita degli Studi di Modena, Facolta di Medicina e Chirurgia				0 1		0 1												
130	Universita di Napoli, Facolta di Medicina e Chirurgia				1 0		6 2					1 2					1 1	1 3	1 1
131	Universita degli Studi di Padova, Facolta di Medicina e Chirurgia				2 0							0 1						1 0	1 1
132	Universita degli Studi di Palermo, Facolta di Medicina e Chirurgia				0 1		1 0					0 1					1 0	1 0	
133	Universita degli Studi di Parma, Facolta di Medicina e Chirurgia											1 2							
134	Universita degli Studi di Pavia, Facolta di Medicina e Chirurgia											0 1							
135	Universita degli Studi di Perugia, Facolta di Medicina e Chirurgia																	1 0	
136	Universita degli Studi di Roma, Facolta di Medicina e Chirurgia				5 2		7 2				1 1	3 6						4 4	
137	Universita degli Studi di Siena, Facolta di Medicina e Chirurgia											0 1							
138	Universita di Torino, Facolta di Medicina e Chirurgia				1 0														
139	Universita degli Studi "Benito Mussolini" di Bari, Facolta di Medicina e Chirurgia				0 1							0 1							
140	Universita di Pisa Facolta di Medicina e Chirurgia																		
	JAPAN																		
141	Tokyo Imperial University Faculty of Medicine				0 1														
142	Nagoya Medical College																	2 0	
143	Chiba University of Medicine				1 0														
144	Okayama Medical College						0 1											1 0	
145	Tohoku Imperial University Medical Faculty, Sendai				1 0														
146	Kyoto Medical College							1 0											
147	Tokyo Charity Association Medical College																		
148	Tokyo Women's Special Medical School																		
149	Keio Gijuku University Medical College, Tokyo				1 0												1 0		
150	Teikoku Women's Medical-Pharmacological College, Toho University, Tokyo				1 0														
151	Faculty of Medicine, Nihon University, Tokyo																		
152	Faculty of Medicine, Hokkaido University, Sapporo, Hokkaido						0 1												
153	Kobe Medical College, Ikuta-ku, Kobe, Hyogo						1 0												
154	Yamaguchi Prefectural University of Medicine																		
	KOREA																		
155	Severance Union Medical College, Keijo, Seoul																	0 1	
156	Seoul National University College of Medicine, Seoul																	2 0	
157	Seoul Women's Medical College, Keijo, Seoul				1 0													0 1	
	LATVIA																		
158	Latvijas Universitate Medicinas Fakultate, Riga											0 2						0 2	
	LEBANON																		
159	American University of Beirut School of Medicine				1 0		1 1		1 0			4 1						2 0	1 0
160	Faculte Francaise de Medecine de l'Universite de St. Joseph, Beyrouth						3 1		1 0								1 0		0 3
	LITHUANIA																		
161	Vytauto Didziojo Universteto Medicinos Fakulteto, Kaunas											2 7						0 1	1 1
	MANCHURIA																		
162	Mukden Medical College, Mukden																		
	MEXICO																		
163	Universidad Nacional Autonoma de Mexico Facultad de Medicina, Mexico, D. F.				2 5		1 1					6 19			1 0			0 2	
164	Escuela de Medicina de Nuevo Leon, Monterrey											2 5							
165	Universidad de Guadalajara Facultad de Ciencias Medicas y Biologicas				1 0														
166	Universidad Nacional del Sureste Facultad de Medicina, Merida, Yucatan											1 0							
167	Escuela Nacional de Medicina Homeopatico del Instituto Politecnico Nacional, Mexico, D. F.											0 1							
168	Universidad Autonoma Facultad de Medicina, Guadalajara				0 2														
	NETHERLANDS																		
169	Universiteit van Amsterdam Geneeskunde Faculteit				1 0		3 1			1 0			2 0					0 1	
170	Rijks-Universiteit te Groningen Medische Faculteit					1 0													
171	Rijks-Universiteit te Leiden Faculteit der Geneeskunde				2 0		3 0					1 2	0 1				1 0	0 1	0 1
172	Rijks-Universiteit te Utrecht Faculteit der Geneeskunde											1 0							1 0
	NEW ZEALAND																		
173	University of New Zealand, Dunedin																		
	NICARAGUA																		
174	Universidad de Nicaragua Facultades de Medicina en Leon y en Granada				0 2							0 1						0 1	
	NORWAY																		
175	Kongelige Frederiks Universitet Medisinske Fakultet, Oslo																		
	PERU																		
176	Universidad Mayor de San Marcos de Lima Facultad de Medicina				1 0							2 0						1 2	
	PHILIPPINES																		
177	University of Santo Tomas Faculty of Medicine and Surgery, Manila				3 1							2 1						1 2	
	Marginal Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

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19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	
Michigan	Minnesota	Mississippi	Missouri	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oregon	Pennsylvania	Rhode Island	South Dakota	Texas	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Hawaii and Puerto Rico	Totals	Examined—Passed	Examined—Failed	% Failed	Number of Boards Examined By	Marginal Number
P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F						
															1 0			0 2						3	1	2	66.7	2	120
												2 0												2	2	0	0.0	1	121
																								2	2	0	0.0	2	122
			0 1				2 1		22 13			2 1		1 0 7 1				1 0					1 0	70	46	24	34.3	14	123
									2 2									1 0						13	9	4	30.8	7	124
			0 1						0 3															8	2	6	75.0	5	125
									0 1									1 0						6	3	3	50.0	3	126
									2 2			0 2												11	6	5	45.5	7	127
																		1 2						3	2	1	33.3	1	128
							5 3		6 5					1 0 1 0										7	2	5	71.4	4	129
							2 1		8 7									0 1						41	24	17	41.5	10	130
							0 1		4 6						1 0			1 0						25	14	11	44.0	7	131
							1 0																	18	9	9	50.0	9	132
							1 0		3 1															4	2	2	50.0	2	133
									1 0															6	4	2	33.3	3	134
			1 0				12 1		33 24	0 1		1 3		2 0 1 0				2 0						9	9	0	0.0	1	135
									0 1															116	72	44	37.9	13	136
							1 0		3 4			1 1			1 0									2	0	2	100.0	2	137
																								12	7	5	41.7	5	138
									1 1			1 1			1 0									7	3	4	57.1	5	139
									0 1															1	0	1	100.0	1	140
																								1	0	1	100.0	1	141
																		1 1						4	3	1	25.0	2	142
																								1	1	0	0.0	1	143
																				1 0				3	2	1	33.3	3	144
																				1 0				2	2	0	0.0	2	145
																								1	1	0	0.0	1	146
																				1 0				1	1	0	0.0	1	147
																				0 1				1	0	1	100.0	1	148
																		1 0						4	4	0	0.0	4	149
															1 0			0 1					0 1	4	2	2	50.0	4	150
																							0 1	1	0	1	100.0	1	151
																		1 1						3	1	2	66.7	2	152
																								1	1	0	0.0	1	153
																		0 1						1	0	1	100.0	1	154
	1 0														1 0			0 1						4	2	2	50.0	4	155
																								2	2	0	0.0	1	156
																		1 0						3	2	1	33.3	3	157
1 0							0 1		3 5			1 3		1 0 1 0										20	7	13	65.0	8	158
	1 0								3 3			2 0		4 0			1 0	2 3						31	23	8	25.8	12	159
									1 1			1 0						1 1						14	8	6	42.9	7	160
							2 0		1 7			0 4												26	6	20	76.9	6	161
									1 0															1	1	0	0.0	1	162
		2 0 0 1				1 0 1 0			0 1			5 2			1 0		8 1 3 5					8 6	82	39	43	52.4	15	163
																	7 2 0 1							17	9	8	47.0	3	164
												1 0											0 1	3	2	1	33.3	3	165
																								1	1	0	0.0	1	166
																		2 2						5	2	3	60.0	2	167
																								2	0	2	100.0	1	168
							1 0		4 0 1 0					1 0				1 2 2 2		1 0		1 0	25	19	6	24.0	13	169
									1 0															2	2	0	0.0	2	170
1 0							5 0 1 0		11 0			1 0						4 1 2 1						80	33	7	17.5	14	171
							3 0 1 0		1 0									1 0						8	8	0	0.0	6	172
												1 0												1	1	0	0.0	1	173
																								5	0	5	100.0	3	174
												1 0												1	1	0	0.0	1	175
1 0							1 0		1 0			1 0			1 0			0 1		1 0				13	10	3	23.0	10	176
									4 6					1 0				1 5	1 0		1 0		4 1	34	18	16	47.0	9	177
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	

Marginal Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Marginal Number	SCHOOL	Alabama	Alaska	Arizona	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Illinois	Indiana	Iowa	Kansas	Louisiana	Maine	Maryland	Massachusetts
		P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F
	PHILIPPINES—Continued																		
178	University of the Philippines College of Medicine, Manila				1 2							2 3						2 0	
179	Manila Central University College of Medicine, Manila				1 1		1 2					0 3						2 2	
	POLAND																		
180	Uniwersytet Jagiellonski Wydzial Lekarski, Cracow											0 1						1 0	
181	Uniwersytet Jana Kazimierza Wydzial Lekarski, Lwow											0 1						1 2	
182	Uniwersytet Joanfa Pilsudskiego, Warszawa						1 0					0 1							
183	Uniwersytet Pomanski Wydzial Lekarski, Poznan											0 1						0 1	
184	Uniwersytet Stefano Batorego Wydzial Lekarski, Wilno																		
	PORTUGAL																		
185	Universidade de Coimbra Faculdade de Medicina						0 1					0 1							
186	Universidade de Lisboa Faculdade de Medicina						1 0												
187	Universidade de Porto Faculdade de Medicina				0 2														
	RUMANIA																		
188	Universitatea din Bucuresti Facultatea de Medicina																	0 1	
189	Universitatea din Iasi Facultatea de Medicina																		
190	Universitatea Regele Ferdinand I-iu din Cluj Facultatea de Medicina si Farmacie											0 1							
	SCOTLAND																		
191	University of Aberdeen Faculty of Medicine												1 0						
192	University of St. Andrews Conjoint Medical School, St. Andrews and Dundee						2 0												
193	University of Edinburgh Faculty of Medicine																	0 1	
194	University of Glasgow Medical Faculty								1 0									0 1	
195	Licentiate of the Royal Colleges of Physicians and Surgeons of Edinburgh, Licentiate of the Royal Faculty of Physicians and Surgeons of Glasgow								1 0 0 1									1 0	
196	Polish School of Medicine, Edinburgh						0 1												
	SOUTH AFRICA																		
197	University of the Witwatersrand Medical School, Johannesburg																		
198	University of Pretoria Faculty of Medicine, Pretoria								1 0			1 0							
199	University of Cape Town Faculty of Medicine, Cape Town																		
	SPAIN																		
200	Universidad de Barcelona Facultad de Medicina																		
201	Universidad de Sevilla Facultad de Medicina											1 0						0 1	
202	Universidad de Granada Facultad de Medicina											0 1							
203	Universidad Central de Espana Facultad de Medicina, Madrid				0 4		1 0			1 0		1 2					1 0	1 0	
204	Universidad de Santiago Facultad de Medicina																		
205	Universidad de Zaragoza Facultad de Medicina											0 1						2 0	
206	Universidad de Valencia Facultad de Medicina						1 1					1 0						1 1	
207	Universidad Literaria de Valladolid Facultad de Medicina				0 1							1 0							
208	Universidad de Salamanca Facultad de Medicina											1 0						1 0	
	SWEDEN																		
209	Karolinska Mediko-Kirurgiska Institutet, Stockholm											1 1							
	SWITZERLAND																		
210	Universitat Basel Medizinische Fakultat						2 0		1 0		1 0	1 1					3 0	1 0	
211	Universitat Bern Medizinische Fakultat				2 0							0 1		1 0			1 0		
212	Universite de Geneve Faculte de Medecine				5 0		10 2		1 0	2 3	1 0							1 0	2 0
213	Universite de Lausanne Faculte de Medecine				1 2		8 1				1 0	2 2						2 2	
214	Universitat Zurich Medizinische Fakultat				0 1		8 1			1 1		0 1						1 0	
	TAIWAN																		
215	Taihoku Special Medical School, Taihoku																	1 0	
	TURKEY																		
216	University of Istanbul Medical Faculty						0 3		1 0			1 4	1 0					5 4	0 1
217	Ankara University Faculty of Medicine, Ankara											0 1							
	UNION OF SOCIALIST SOVIET REPUBLICS																		
218	First Leningrad Medical Institute, Leningrad																		
219	Kazan Medical Institute, Kazan																		
220	Kharkov Medical Institute, Kharkov											0 2						0 1	
221	Kiev Medical Institute, Kiev											0 1							
222	Odessa Medical Institute, Odessa				0 1														
223	Severo-Kavka Medical Institute, Rostov-on-the-Don																		
224	Krim Medical Institute, Simferopol											0 1							
225	Tbilisi Institute of Medicine, Tbilisi											0 1							
226	Stalino Institute of Medicine, Stalino											0 1							
227	Samarkand Institute of Medicine, Samarkand																		
228	Ashkhabad Institute of Medicine, Ashkhabad																		
229	Daghestan Medical Institute, Makhach, Kala																		
230	Byelorussian Medical Institute, Bazamaya ul., Minsk																		
231	First Moscow Medical Institute, Moscow																		
	WALES																		
232	Welsh National School of Medicine, Cardiff						1 0												
	YUGOSLAVIA																		
233	Zagrebashog Universiteta Medecinski Fakultet, Zagreb											0 3						0 2	
234	Beogradskog Universiteta Medecinski Fakultet, Beograd											1 2							
235	Medicinska Visoka Sola, Ljubljana, Yugoslavia																		
	Totals Examined—Passed	2	1	3	98	1	130	3	15	14	8	169	8	2	1	1	26	114	21
	Totals Examined—Failed	0	0	0	65	0	58	2	0	14	0	278	1	0	0	0	9	66	36
	Totals	2	1	3	163	1	194	5	15	28	8	439	9	2	1	1	35	180	57
	Percentage Failed	0.0	0.0	0.0	39.9	0.0	29.9	40.0	0.0	50.0	0.0	63.5	11.1	0.0	0.0	0.0	25.7	36.7	63.2
	Marginal Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

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19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	
Michigan	Minnesota	Mississippi	Missouri	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oregon	Pennsylvania	Rhode Island	South Dakota	Texas	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Hawaii and Puerto Rico	Totals	Examined—Passed	Examined—Failed	% Failed	Number of Boards Examined By	Maryland Number
P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F	P F						
1 0																							2 0	13	8	5	38.5	5	178
																		0 1						13	4	9	69.2	5	179
									0 5								1 0							6	2	6	75.0	4	180
1 0							1 0		3 2			0 2												13	6	7	53.8	4	181
									0 6			1 1												10	2	8	80.0	4	182
									2 1			1 1		1 0										8	4	4	50.0	5	183
									0 1			0 1		1 0										3	1	2	66.7	3	184
																		1 0						3	1	2	66.7	3	185
												1 0			1 0									3	3	0	0.0	3	186
																								2	0	2	100.0	1	187
									3 3									1 1						9	4	5	55.6	3	188
									1 1															2	1	1	50.0	1	189
									0 1															2	0	2	100.0	2	190
									2 0									1 0 1 0						5	5	0	0.0	4	191
									4 2															8	6	2	25.0	4	192
									3 1															5	3	2	40.0	2	193
									2 0						1 0		1 0	2 1						9	7	2	22.2	6	194
									0 1															4	2	2	50.0	4	195
									1 0						1 0			0 1						4	2	2	50.0	4	196
1 0									1 0															2	2	0	0.0	2	197
1 0																								3	3	0	0.0	3	198
									0 1															1	0	1	100.0	1	199
																	1 1	1 0					3 0	6	5	1	16.7	3	200
																								2	1	1	50.0	2	201
																							1 0	2	1	1	50.0	2	202
												1 1						1 2					17 3	36	24	12	33.3	9	203
																							2 1	3	2	1	33.3	4	204
																								3	2	1	33.3	3	205
							1 0		0 1			1 0						0 1						9	5	4	44.4	7	206
																								2	1	1	50.0	2	207
																							4 0	6	6	0	0.0	3	208
							1 0														1 0			4	3	1	25.0	3	209
	1 0						1 0		2 0									0 1						15	13	2	13.3	10	210
							1 0		17 5			2 0					1 0							31	25	6	19.4	8	211
1 0			1 0				7 0		36 10			3 0		3 0 1 0				2 3			1 1		1 0	68	79	19	19.4	17	212
	1 0						3 0		39 6					3 0 2 0				0 1						57	43	14	24.6	11	213
1 0				1 0			5 0		6 4			1 1		3 0 1 0					1 0		1 0			39	30	9	23.1	14	214
																								1	1	0	0.0	1	215
1 0									5 3			1 0						2 4			1 0			37	18	19	51.4	11	216
																		1 1						3	1	2	66.7	2	217
							1 0																	1	1	0	0.0	1	218
									0 1															1	0	1	100.0	1	219
												0 4												7	0	7	100.0	3	220
							1 2		1 0			1 1												7	3	4	57.1	4	221
									1 0															2	1	1	50.0	2	222
1 0												0 1												2	1	1	50.0	2	223
																								1	0	1	100.0	1	224
												0 2												2	0	2	100.0	2	225
																								1	0	1	100.0	1	226
														1 0										1	1	0	0.0	1	227
																								1	1	0	0.0	1	228
							1 0																	1	0	1	100.0	1	229
									0 1			0 1													2	0	2	100.0	1	230
							0 2																	1	0	1	100.0	1	231
									0 1																				
																								1	1	0	0.0	1	232
1 0							1 0		0 2					1 0							1 0			11	4	7	63.6	7	233
									0 3			1 2												9	2	7	77.8	3	234
			2 3				1 0																	1	1	0	0.0	1	235
31	14	5	2	1	1	1	111	2	352	1	1	71	1	35	42	1	35	95	12	4	14	1	71	1,518					
0	0	0	3	0	0	0	24	0	262	4	1	35	0	0	1	0	10	94	6	0	1	0	19	1,049					
31	14	5	5[3]	1	1	1	135	2	614	5	2	106	1	35	43	1	45	189	18	4	15	1	90	2,567					
0.0	0.0	0.0	60.0	0.0	0.0	0.0	17.8	0.0	42.7	80.0	50.0	67.2	0.0	0.0	2.3	0.0	22.2	49.7	33.3	0.0	6.7	0.0	21.1	40.9					
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	

TABLE 31.—*Physicians Examined on the Basis of Credentials Obtained in Countries Other Than the United States and Canada, 1930-1958*

Year	Number Examined	Passed	Percentage Failed
1930	167	92	44.9
1931	158	91	42.4
1932	182	96	47.3
1933	200	129	35.5
1934	285	170	40.2
1935	437	303	30.7
1936	588	392	33.0
1937	920	637	30.8
1938	1,164	716	38.5
1939	1,691	839	50.4
1940	2,088	948	54.7
1941	1,717	698	59.2
1942	1,620	890	45.4
1943	1,031	518	49.8
1944	691	325	53.0
1945	475	209	56.0
1946	495	221	55.3
1947	691	283	59.9
1948	629	311	51.3
1949	737	319	56.7
1950	709	359	53.6
1951	1,006	524	47.9
1952	1,208	648	46.3
1953	1,463	786	46.3
1954	1,642	943	42.6
1955	1,771	1,042	41.4
1956	1,780	1,012	43.2
1957	2,299	1,345	41.5
1958	2,567	1,518	40.9
Totals	30,434	16,394	46.2

have been on the list. Rather, this action reflects the Councils' inability to acquire and maintain a continuing, adequate knowledge of the educational programs of the foreign medical schools whose graduates come to the United States.

The two Councils now recommend that agencies in the United States concerned with the medical qualifications of graduates of foreign medical schools consider certification by the Educational Council for Foreign Medical Graduates as evidence that the recipient of such certification is possessed of medical knowledge comparable to that expected of graduates of approved medical schools in the United States and Canada. These two Councils further recommend that such certification be considered as evidence of the quality of medical training offered by the medical school attended by the holder of a certificate at the time of his graduation.

The present requirements for foreign-trained physicians seeking medical licensure in the United States and its territories and possessions are given in table 29. This chart was developed in an effort to assist the foreign-trained physician seeking licen-

TABLE 32.—*Foreign-Trained Physicians Licensed By State Boards, 1946-1958*

	Examination							Reciprocity and Endorsement							Grand Total
	1946-1953	1954	1955	1956	1957	1958	Total	1946-1953	1954	1955	1956	1957	1958	Total	
Alabama	4	2	1	1	1	2	11	3	0	0	0	1	0	4	15
Alaska	..	..	..	..	..	1	1	..	..	..	..	..	0	0	1
Arizona	3	0	2	2	6	3	16	4	1	4	1	0	0	10	26
Arkansas	1	0	0	0	0	0	1	1	0	1	0	0	0	2	3
California	384	83	135	129	90	98	919	49	1	0	0	0	0	50	969
Colorado	40	1	3	0	4	1	49	0	0	0	0	0	0	0	49
Connecticut	68	13	13	25	87	136	342	77	19	22	16	19	5	159	501
Delaware	4	1	1	3	4	3	16	5	3	0	0	1	2	11	27
District of Columbia	27	6	2	2	8	15	60	58	14	10	12	16	26	136	196
Florida	60	13	27	14	28	14	156	0	0	0	0	0	0	0	156
Georgia	19	6	2	5	5	8	45	7	3	3	6	2	1	22	67
Idaho	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1
Illinois	505	236	157	79	128	160	1,335	0	3	0	0	0	0	3	1,338
Indiana	2	20	2	3	6	8	42	7	16	4	9	21	17	74	116
Iowa	17	5	4	12	7	2	47	30	2	1	1	3	1	38	85
Kansas	5	1	3	5	2	1	17	0	0	0	0	0	0	0	17
Kentucky	1	0	0	0	0	0	1	2	1	0	1	0	0	4	5
Louisiana	1	3	1	0	0	1	6	0	0	0	0	0	0	0	6
Maine	28	16	44	25	24	20	163	12	7	6	4	5	8	42	205
Maryland	134	41	55	71	126	114	544	6	1	0	1	1	0	9	553
Massachusetts	58	7	11	16	24	21	137	9	4	2	4	0	0	19	156
Michigan	31	25	40	22	30	31	180	11	7	17	14	23	14	86	266
Minnesota	50	17	17	16	17	14	131	0	0	0	0	1	0	1	132
Mississippi	7	1	2	0	2	5	17	2	0	0	0	0	0	2	19
Missouri	39	4	14	11	9	2	79	5	1	0	2	0	0	8	87
Montana	1	0	0	0	0	0	1	2	1	0	0	0	0	3	4
Nebraska	3	0	0	1	1	1	6	7	1	0	0	1	3	12	18
Nevada	0	0	0	0	0	1	1	0	1	0	0	0	0	1	2
New Hampshire	8	4	3	6	5	1	27	20	6	3	5	7	7	48	75
New Jersey	41	19	23	41	86	111	321	105	24	22	42	23	37	343	664
New Mexico	2	3	4	0	3	2	14	16	1	1	2	0	0	20	34
New York	1,257	184	159	193	268	352	2,413	247	8	7	5	1	3	271	2,684
North Carolina	22	8	0	0	1	1	32	5	1	2	1	1	1	11	43
North Dakota	25	0	5	7	2	1	40	0	0	0	0	0	0	0	40
Ohio	191	117	109	117	86	71	741	188	48	47	27	19	71	400	1,142
Oklahoma	2	0	0	0	0	0	2	3	1	1	0	0	1	6	8
Oregon	1	0	0	0	0	1	2	0	0	0	0	0	0	0	2
Pennsylvania	42	12	6	10	15	35	120	0	0	0	0	0	0	0	120
Rhode Island	69	34	35	39	36	42	255	2	1	1	2	4	11	21	276
South Carolina	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1
South Dakota	18	2	4	1	13	1	39	1	0	0	1	3	0	5	44
Tennessee	6	1	0	2	0	0	9	3	0	0	3	0	5	11	20
Texas	50	14	16	17	34	35	166	28	0	3	4	1	3	39	205
Utah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vermont	1	0	0	0	0	0	1	4	2	3	2	2	2	14	15
Virginia	39	23	54	84	91	95	386	16	0	0	0	0	0	16	402
Washington	21	5	5	7	9	12	59	13	4	6	5	7	17	52	111
West Virginia	9	1	0	8	7	4	29	0	0	0	0	0	0	0	29
Wisconsin	6	3	2	2	7	14	34	4	3	1	8	12	10	39	73
Wyoming	0	0	0	0	0	1	1	2	0	0	0	0	0	2	3
U. S. Possessions and Territories	63	29	30	35	72	71	300	24	3	0	2	5	5	39	339
Totals	3,457	943	1,042	1,012	1,345	1,518	9,317	1,067	188	168	180	180	250	2,033	11,350

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sure in the United States. While an attempt has been made to present the situation as it exists, the table is intended to give only a summary of existing requirements. Persons interested in licensure should supplement these data by communicating with the licensing boards. Medical licensure in the United States is a "state right" and is entirely under the jurisdiction of the governments of the individual states. The power to license physicians is exercised through the medical licensing board of each state, territory or possession. There is also available from the office of either Council a pamphlet entitled "The Present and Future Status of Foreign Medical School Credentials in the United States" which contains helpful information to foreign-trained physicians.

Table 30 records the number of graduates of foreign faculties of medicine examined for medical licensure by 43 boards in 1958. The figures include both American and foreign-born physicians educated abroad. Graduates of the medical schools in the Philippines, New Zealand, 13 South and Central American countries, 26 countries in Europe, and 15 countries in Asia were represented at examinations. The number totaled 2,567. Graduates of 231 medical schools and four licensing corporations were examined. The number who were successful was 1,518; failures numbered 1,049, or 40.9%. More than 75 graduates each from the University of Cuba, Munich, Athens, Rome, Mexico, and Geneva were tested in 1958, and more than 20 graduates from 33 other schools were examined. The following eight states examined the greatest number of foreign-trained physicians.

	Examined	Passed	Failed, No.	Failed, %
New York	614	352	262	42.7
Illinois	438	160	278	63.5
Connecticut	194	136	58	29.9
Virginia	189	95	94	49.7
Maryland	180	114	66	36.7
Ohio	166	71	95	57.2
California	163	98	65	39.9
New Jersey	135	111	24	17.8

Table 31 presents the number of graduates of foreign faculties of medicine examined for medical licensure in the United States in 29 years (1930-1958). In 1936 the number of foreign-trained physicians seeking licensure in the United States began to increase, and by 1940 over three times as many were tested as in 1936. Beginning in 1944, the number examined began to decrease until 1951, when there was a noticeable increase. In each succeeding year the number of examined has increased. In 1958, the increase over the previous year was 268. At no time in the 29-year period did fewer than 30% fail in a given year.

In table 32 figures are given for 13 years showing the number of foreign-trained physicians licensed by each state board, both after written examination and by endorsement of credentials. Aggregate figures are given for the years 1948-1953, inclusive,

TABLE 33.—*Graduates of Foreign Medical Faculties Representing Additions to the Medical Profession, 1958*

	Examination	Reciprocity and Endorsement	Total
Alabama	0	0	0
Alaska	1	0	1
Arizona	2	0	2
Arkansas	0	0	0
California	62	0	62
Canal Zone	0	0	0
Colorado	2	0	2
Connecticut	80	0	80
Delaware	3	0	3
District of Columbia	5	12	17
Florida	6	0	6
Georgia	2	4	6
Guam	0	2	2
Hawaii	6	0	6
Idaho	0	0	0
Illinois	147	0	147
Indiana	8	9	17
Iowa	6	0	6
Kansas	1	0	1
Kentucky	0	0	0
Louisiana	0	0	0
Maine	18	0	18
Maryland	114	0	114
Massachusetts	7	0	7
Michigan	18	1	19
Minnesota	10	4	14
Mississippi	4	0	4
Missouri	0	0	0
Montana	0	0	0
Nebraska	0	0	0
Nevada	1	0	1
New Hampshire	0	2	2
New Jersey	75	0	75
New Mexico	2	0	2
New York	249	0	249
North Carolina	0	0	0
North Dakota	0	0	0
Ohio	67	0	67
Oklahoma	0	0	0
Oregon	1	0	1
Pennsylvania	20	0	20
Puerto Rico	56	0	56
Rhode Island	35	2	37
South Carolina	0	0	0
South Dakota	4	0	4
Tennessee	0	0	0
Texas	19	0	19
Utah	0	0	0
Vermont	0	0	0
Virgin Islands	1	1	2
Virginia	63	0	63
Washington	12	0	12
West Virginia	3	0	3
Wisconsin	10	0	10
Wyoming	0	0	0
Totals	1,129	37	1,166

TABLE 34.—*Additions to the Medical Profession Representing Graduates of Foreign Medical Faculties 1950-1958*

Year	Examination	Reciprocity and Endorsement	Totals
1950	367	41	408
1951	425	25	450
1952	545	24	569
1953	662	23	685
1954	749	23	772
1955	881	26	907
1956	834	18	852
1957	991	23	1,014
1958	1,129	37	1,166
Totals	6,483	240	6,723

and for each individual year from 1954 to 1958. While table 31 reflects the candidates registered after examination only and indicates the percentage failing in each year, table 32 records the total licensed in each state. In the period shown there were 9,317 licenses issued to foreign-trained physicians after written examination and 2,033 by endorsement of credentials. The total number of licentiates in both groups registered was 11,350.

Represented in table 33 are figures regarding the foreign-trained physicians registered in 1958 who were not previously licensed in the United States and who, therefore, are additions to the medical profession. There were 1,166 in this group, of whom 1,129 were licensed by written examination and 37 by endorsement of credentials. Comparative figures for eight previous years together with the figures for 1958 are given in table 34. In eight years (1950-

CORRESPONDING OFFICERS OF BOARDS OF MEDICAL EXAMINERS IN THE UNITED STATES, TERRITORIES, AND OUTLYING POSSESSIONS

Alabama	Dr. D. G. Gill, Secretary, State Office Building, Montgomery 4.
Alaska	Dr. W. M. Whitehead, Secretary, 172 S. Franklin St., Juneau.
Arizona	Mr. Robert Carpenter, Executive Secretary, 826 Security Bldg., Phoenix.
Arkansas	Dr. Joe Verser, Secretary, Harrisburg.
California	Dr. Louis E. Jones, Secretary, Room 536, 1020 N St., Sacramento.
Canal Zone	Dr. Eric R. Osterberg, Health Director, Balboa Heights.
Colorado	Dr. John B. Farley, Secretary, 715 Republic Bldg., 1612 Tremont Place, Denver 2.
Connecticut	Dr. Stanley B. Weld, Secretary, 160 St. Ronan St., New Haven.
Delaware	Dr. Joseph S. McDaniel, Secretary, Professional Bldg., Dover.
District of Columbia	Mr. Paul Foley, Deputy Director, 1740 Massachusetts Ave., N.W., Washington.
Florida	Dr. Homer L. Pearson, Secretary, 901 N.W. 17th St., Miami 36
Georgia	Mr. Cecil L. Clifton, Secretary, 224 State Capitol, Atlanta 3.
Guam	Dr. John E. Kennedy, Secretary, Marianas Islands, Agana.
Hawaii	Dr. I. L. Tilden, Secretary, 1020 Kapiolani St., Honolulu.
Idaho	Mr. Armand L. Bird, Executive Secretary, 364 Sonna Bldg., Boise.
Illinois	Mr. Fredric B. Selcke, Superintendent of Registration, Capitol Bldg., Springfield.
Indiana	Miss Ruth V. Kirk, Executive Secretary, 538 K. of P. Bldg., Indianapolis.
Iowa	Mr. Ronald V. Saf, Executive Secretary, State Office Building, Des Moines 19.
Kansas	Dr. F. J. Nash, Secretary, New Brotherhood Bldg., Kansas City.
Kentucky	Dr. Russell E. Teague, Secretary, 620 South Third St., Louisville 2.
Louisiana	Dr. Edwin H. Lawson, Secretary, 930 Hibernia Bank Bldg., New Orleans 12.
Maine	Dr. Stephen A. Cobb, Secretary, Sanford.
Maryland	Dr. Frank K. Morris, Secretary-Treasurer, 1211 Cathedral St., Baltimore 1.
Massachusetts	Dr. David W. Wallwork, Secretary, State House, Room 37, Boston 33.
Michigan	Dr. E. C. Swanson, Executive Secretary, 118 Stevens T. Mason Bldg., West Michigan Ave., Lansing 8.
Minnesota	Dr. F. H. Magney, Secretary, 230 Lowry Medical Arts Bldg., St. Paul 2.
Mississippi	Dr. R. N. Whitfield, Assistant Secretary, Old Capitol, Jackson 13.
Missouri	Mr. John A. Hailey, Executive Secretary, State Capitol Building, P. O. Box 4, Jefferson City.
Montana	Dr. Thomas L. Hawkins, Secretary, 555 Fuller Ave., Helena.
Nebraska	Mr. R. K. Kirkman, Director, Room 1009, State Capitol Build., Lincoln 9.
Nevada	Dr. George H. Ross, Secretary, 112 North Curry St., Carson City.
New Hampshire	Dr. Edward W. Colby, Secretary, 61 South State St., Concord.
New Jersey	Dr. Royal A. Schaaf, Secretary, 28 West State St., Trenton.
New Mexico	Dr. R. C. Derbyshire, Secretary, 227 East Palace Ave., Santa Fe.
New York	Dr. Stiles D. Ezell, Secretary, 23 South Pearl St., Albany 7.
North Carolina	Dr. Joseph J. Combs, Secretary, 716 Professional Bldg., Raleigh.
North Dakota	Dr. C. J. Glaspel, Secretary, Box 228, Grafton.
Ohio	Dr. H. M. Platter, Secretary, 21 West Broad St., Columbus 15.
Oklahoma	Dr. E. F. Lester, Secretary, 813 Braniff Bldg., Oklahoma City.
Oregon	Mr. Howard I. Bobbitt, Executive Secretary, 609 Failing Bldg., Portland 4.
Pennsylvania	Mrs. Margaret G. Steiner, Secretary, Box 911, Harrisburg.
Puerto Rico	Mr. Joaquin Mercado Cruz, Secretary, Box 9156, Santurce.
Rhode Island	Mr. Thomas B. Casey, Administrator, 366 State Office Bldg., Providence.
South Carolina	Dr. Harold E. Jervey Jr., Secretary, 1329 Blanding St., Columbia.
South Dakota	Mr. John C. Foster, Executive Secretary, 300 First National Bank Bldg., Sioux Falls.
Tennessee	Dr. H. W. Qualls, Secretary, 1635 Exchange Bldg., Memphis 3.
Texas	Dr. M. H. Crabb, Secretary, 1714 Medical Arts Bldg., Fort Worth 2.
Utah	Mr. Frank E. Lees, Director, 324 State Capitol Building, Salt Lake City 1.
Vermont	Dr. F. J. Lawliss, Secretary, Richford.
Virgin Islands	Dr. Rudolph U. Lanclos, Secretary, Charlotte Amalie.
Virginia	Dr. K. D. Graves, Secretary, 631 First St., S.W., Roanoke.
Washington	Mr. Thomas A. Carter, Administrator, Capitol Building, Olympia.
West Virginia	Dr. Newman H. Dyer, Secretary, State Office Building, No. 3, Charleston 5.
Wisconsin	Dr. Thomas W. Tormey Jr., Secretary, 1140 State Office Bldg., 1 West Wilson St., Madison.
Wyoming	Dr. Franklin D. Yoder, Secretary, State Office Building, Cheyenne.

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1958) there were 6,483 foreign-trained physicians who were added to the physician population of the United States, 6,483 obtaining licensure by written examination, and 240 by endorsement of credentials.

BOARDS OF EXAMINERS IN THE BASIC SCIENCES

Basic science laws currently exist in 21 states and the District of Columbia. The enactment of a basic science law provides for the establishment of a state board of examiners in the basic sciences underlying the practice of the healing art, to provide for its organization and powers, to provide that certificates by that board be a prerequisite to eligibility for examination for licenses to practice the healing art, and to define the healing art. Basic science boards have no licensing powers. The healing art, as defined in the statutes, includes any system, treatment, operation, diagnosis, prescription, or practice for the ascertainment, cure relief, palliation, adjustment, or correction of any human disease, ailment, deformity, injury, or unhealthy or abnormal physical or mental condition.

Table 35 lists the states where basic science laws exist and the year of enactment. Minnesota, Nebraska, and Washington, in 1927, were the first states to effect such legislation; Kansas under a "Healing Arts Act", in 1957, was the last state to require such certification.

The specific basic sciences designated in the legislation vary with the different laws. All boards examine in anatomy, pathology, and physiology, and the majority include bacteriology and chemistry. Ten include Hygiene, two diagnosis, and one requires public health. Table 36 lists the basic science boards and the subjects in which examinations are required.

TABLE 35.—*States Having Basic Science Laws and Year of Enactment*

Alaska	1946	Nebraska	1927
Arizona	1936	Nevada	1951
Arkansas	1929	New Mexico	1941
Colorado	1927	Oklahoma	1927
Connecticut	1925	Oregon	1924
District of Columbia	1929	Rhode Island	1940
Florida	1939	South Dakota	1939
Iowa	1935	Tennessee	1943
Kansas	1957	Texas	1949
Michigan	1927	Washington	1927
Minnesota	1927	Wisconsin	1925

The laws in some states provide for certification without examination by exemption, waiver, reciprocity, or endorsement. The credentials acceptable for certification by one of these methods are outlined in table 37.

The results of examinations given and the number of certificates issued on the basis of waiver, exemption, reciprocity, or endorsement, as reported by the basic science boards during 1958, are shown in tables 38 and 39. The laws generally do not specify that a candidate reveal his school of practice but were developed for the purpose of insuring, insofar as possible, that all individuals who enter into the area of the healing arts have what is considered to be an adequate preparatory background. Table 38 records the total number of candidates reported by the several boards as having been examined and the number who passed and failed. No attempt has been made to differentiate the schools of the healing arts represented by the candidates examined or certified. Twelve boards either had no failures or did not report figures for failures. The percentage of candidates failing is given for those states that did submit these data.

TABLE 36.—*Subjects Included in Basic Science Examinations*

	Anatomy	Bacteriology	Chemistry	Diagnosis	Hygiene	Pathology	Physiology	Public Health
Alaska	X	X	X	..	X	X	X	..
Arizona	X	X	X	..	X	X	X	..
Arkansas	X	X	X	..	X	X	X	..
Colorado	X	X	X	..	..	X	X	..
Connecticut	X	..	..	X	X	X	X	..
District of Columbia	X	X	X	..	..	X	X	..
Florida	X	X	X	..	..	X	X	..
Iowa	X	X	X	..	X	X	X	..
Kansas	X	X	X	..	..	X	X	..
Michigan	X	X	X	..	..	X	X	..
Minnesota	X	X	X	..	X	X	X	..
Nebraska	X	X	X	..	X	X	X	..
Nevada	X	X	X	..	..	X	X	..
New Mexico	X	X	X	..	..	X	X	..
Oklahoma	X	X	X	..	..	X	X	..
Oregon	X	X	X	..	X	X	X	..
Rhode Island	X	X	X	..	..	X	X	..
South Dakota	X	X	X	..	..	X	X	..
Tennessee	X	X	X	..	..	X	X	..
Texas	X	X	X	..	X	X	X	X
Washington	X	X	X	..	X	X	X	..
Wisconsin	X	..	..	X	..	X	X	..

The 22 boards in operation in 1958 examined 4,600 candidates and granted certificates of proficiency in the basic sciences by written examination to 3,592 individuals. In addition, as noted in table 39, there were 2,677 certificates issues by reciprocity, endorsement, exemption, or waiver by 21 boards. The number of applicants registered with or without examination in 1958 was 6,269. Of these, Texas issued 741, Florida 666, Michigan 571, and Wisconsin 508. Other states ranged from Alaska with 22 to Arkansas with 456.

In the 32 years since the enactment of the first such laws (table 40) 95,069 certificates in the basic sciences have been issued, 66,282 by examination and 29,787 by reciprocity, endorsement, exemption, or waiver. The percentage of failures in this period was 20.5.

The fees for certification in the basic sciences in the states requiring such certification are given in table 41. Examination and endorsement meetings are held in most instances semiannually, although some boards meet quarterly. THE JOURNAL publishes semimonthly the future dates of examination and reciprocity or endorsement meetings of all basic science boards.

In 1958 there were 4,600 examinations given by basic science boards; 3,592 were successful and 1,008 were unsuccessful, thereby failing to give evidence of basic preparation adequate to qualify for further consideration for licensure. Figures on how many individuals these 1,008 failures represent were not available for this report. The boards are not uniform with respect to repetition of examinations

TABLE 37.—*Reciprocity, Endorsement, Waiver, or Exemption Policies of Basic Science Boards*

Alaska

Physicians are accepted on reciprocity from those states with which the board of medical examiners has established reciprocal agreements.

Arizona

A reciprocal certificate issued on the basis of a basic science certificate that has been obtained by an examination before the issuing board and provided that at least four subjects were passed at one sitting unless the state in question examines in fewer than four of the six subjects required by the Arizona law. Reciprocity will be extended to those applicants who were licensed to practice in a state prior to the passage of the basic science law of that state.

Arkansas

Reciprocity on the basis of written examination taken before all states having basic science laws except Florida, Iowa, and Tennessee. The credential of the National Board of Medical Examiners is acceptable for reciprocal registration. State medical board examinations in the basic science subjects are acceptable when they are deemed to be equivalent to the Arkansas basic science examination.

Colorado

Reciprocity as to examination with the following basic science boards: Alaska, Arizona, Arkansas, District of Columbia, Kansas, Michigan, Minnesota, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, Rhode Island, South Dakota, Tennessee, Texas, and Washington.

Reciprocity as to examination with the Iowa Basic Science Board is granted to those candidates having made original application to that board on or before June 1, 1949. Candidates making application after that date and holding a certificate must meet the minimum requirements, i.e., that the candidate pass an examination in the basic sciences under a basic science board and that he pass, at one sitting, at least four of the five subjects given by the basic science board of Colorado, with subsequent passing of the fifth subject.

With Connecticut and Wisconsin there is reciprocity as to examination in the subjects of anatomy, physiology, and pathology. Candidates from these states are required to pass the examinations in chemistry and bacteriology.

Connecticut

No reciprocity with other basic science boards. Certification by endorsement obtainable by diplomates of the National Board of Medical Examiners or to candidates holding a license obtained by examination in another state. The latter is acceptable only after three years' professional activity.

District of Columbia

Reciprocity has not been established with the basic science boards. The basic science board may exempt an applicant. All applications are considered on an individual basis. Basic science examination as part of a medical license used for reciprocal licensure would be acceptable if licensure was granted.

Florida

No reciprocity, waiver, or exemption policies.

Iowa

All applications considered on an individual basis. May accept examination results of other boards if, in the opinion of the Iowa board, the examination is considered equal to that of the Iowa board.

Kansas

No formal reciprocal agreements. Board will consider on an individual basis acceptance of examinations given by other basic science board, state medical boards, and part 1 of the examination of the National Board of Medical Examiners.

Michigan

Certificates issued by examination are accepted for registration by waiver from the basic science boards of Alaska, Arizona, Arkansas, Colorado, District of Columbia, Iowa, Kansas, Minnesota, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, Rhode Island, South Dakota, Tennessee, Texas and Wisconsin. Applicants who present certificates from the Wisconsin Basic Science Board are examined in bacteriology and chemistry.

The Michigan Board may accept, in lieu of its own examination, the basic science portion of the examination given by any legally constituted examining or licensing board in the healing arts if such examination is equal or equivalent to the examinations given by the Michigan Board.

Minnesota

Reciprocity on an automatic basis with the basic science boards of Colorado, Nebraska, Oregon and Tennessee (after Feb. 9, 1959), and on the basis of having passed part 1 of the examination of the National Board of Medical Examiners.

Reciprocity on an individual basis with the basic science boards of Alaska, Arizona, Connecticut, Michigan (grades must be 75% or more in each subject), Nevada, New Mexico, Oklahoma, South Dakota, and Texas.

Reciprocity on an individual basis with the medical licensing boards of California, Indiana, Kansas, Kentucky, New York (subsequent to 1925—any before 1925 required to take examinations in bacteriology and pathology), Oklahoma, Texas, Vermont, Virginia, Washington (grades must be 75% or more in each subject), and West Virginia.

Partial credit granted for grades in certain subjects passed in examinations of medical licensing boards of Alabama, Georgia, Louisiana, Maryland, North Carolina, Washington, and Wisconsin.

Nebraska

The board will permit waiver of examination. Applications are considered individually. States eligible for consideration are those granting exemptions from examination to those from Nebraska where the conditions of the laws and regulations have been met, even though these conditions differ somewhat from those of Nebraska. Waiver applied to both basic science boards and medical boards.

Nevada

Reciprocity on the basis of written examination with the basic science boards of Arizona, Colorado, Iowa, Minnesota, New Mexico, Oklahoma, Oregon, South Dakota, Tennessee, Texas, and Washington. Waiver with basic science boards of Arkansas, Florida, Michigan and Nebraska. Applicants holding a Wisconsin Basic Science certificate must be examined in bacteriology and chemistry.

New Mexico

By reciprocity with Arizona, Arkansas, Colorado, Iowa, Michigan, Minnesota, Nevada, Oklahoma, Oregon, Rhode Island, South Dakota, Tennessee, Washington, and Wisconsin. Certificates granted by waiver to doctors who have been in continuous practice for thirty consecutive years or more and who have taken and passed examinations in the basic sciences.

Oklahoma

Applicants are reviewed on an individual basis. If qualified, will be accepted provided other state extends a like privilege to those holding basic science certificate of Oklahoma Board. A basic science certificate is not a prerequisite for licensure by reciprocity but is a requirement for licensure by examination.

Oregon

Reciprocity with the basic science boards of Arizona, Arkansas, Colorado, Iowa, Michigan, Minnesota, Nebraska, Nevada, New Mexico, Oklahoma, South Dakota, Tennessee, Texas, Washington, and Wisconsin.

Rhode Island

Endorsement after oral examination with Massachusetts Board of Registration in Medicine and basic science boards of Colorado, District of Columbia, and Oklahoma.

South Dakota

Reciprocity with the basic science boards of Alaska, Arizona, Arkansas, Colorado, Iowa, Kansas, Michigan, Minnesota, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, Rhode Island (on an individual basis), Tennessee, Texas, Washington, and Wisconsin.

Tennessee

Reciprocity with all basic science boards except Arkansas, Connecticut, Florida, Iowa, New Mexico, Rhode Island, and Wisconsin.

Texas

Reciprocity with the basic science boards of Alaska, Arizona, Arkansas, Colorado, Iowa, Michigan, Minnesota, Nebraska, Nevada, Oklahoma, Oregon, South Dakota, Tennessee, and Washington. Applicants from Wisconsin required to pass examination of Texas board in bacteriology, chemistry, and public health and hygiene.

Washington

Reciprocity with all basic science boards.

Wisconsin

Waiver to commissioned officers of the armed forces or the Public Health Service to an applicant who has passed part 1 of the examination of the National Board of Medical Examiners, to a physician licensed to practice medicine in a state not having a basic science law or licensed in a state before the establishment of a basic science board provided he has served an internship or has practiced for at least one year since the license was granted, to a physician licensed in Canada, and to foreign trained physicians holding an M.D. degree from an acceptable school who are licensed to practice medicine in the country in which the school attended is located. Reciprocity is also granted on the basis of written examination with all states having basic science boards.

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that have been failed and the accumulation of credit. The variance which exists in the evaluation methods of the states makes it impossible to analyze the figures on a comparable basis from state to state.

Although it is recognized that the data presented may be useful to those seeking licensure in these states, it is advisable to supplement the information by direct communication with the basic science board. The present executive corresponding officer of each of the 22 basic science boards is as follows:

Alaska.....Dr. R. Harrison Leer, Room 204, Alaska Office Bldg., Juneau.

Arizona.....Mr. Herman E. Bateman, University of Arizona, Tucson.

Arkansas.....Mr. S. C. Dellinger, Zoology Department, University of Arkansas, Fayetteville.

Colorado.....Dr. Esther B. Starks, 1459 Ogden St., Denver 18.

Connecticut.....Mrs. Regina G. Brown, 258 Bradley St., New Haven 10.

District of Columbia...Mr. Paul Foley, 1740 Massachusetts Ave., N. W., Washington 6.

Florida.....Mr. M. W. Emmel, Box 340, Gainesville.

Iowa.....Mr. Elmer W. Hertel, Wartburg College, Waverly.

Kansas.....Dr. L. C. Heckert, Pittsburg State Teachers College, Lansing.

Michigan.....Mrs. Anne Baker, 116 Stevens T. Mason Bldg., W. Michigan Ave., Lansing 15.

Minnesota.....Dr. Raymond N. Bieter, 165 Millard Hall, University of Minnesota, Minneapolis.

Nebraska.....Mr. R. K. Kirkman, Room 1009, State Capitol Bldg., Lincoln 9.

Nevada.....Dr. Donald G. Cooney, Box 9005, University Station, Reno.

New Mexico.....Mrs. Marguerite Cantrell, Box 1522, Santa Fe.

Oklahoma.....Mrs. Lucille Haidek, 813 Braniff Bldg., Oklahoma City.

Oregon.....Dr. Earl M. Pallett, State Board of Higher Education, Box 5175, Eugene.

Rhode Island.....Mr. Thomas B. Casey, 366 State Office Bldg., Providence.

South Dakota.....Dr. Gregg M. Evans, 310 E. 15th St., Yankton.

Tennessee.....Dr. O. W. Hyman, 62 S. Dunlap St., Memphis.

Texas.....Bro. Raphael Wilson, 407 Perry-Brooks Bldg., Austin.

Washington.....Mr. Thomas A. Carter, Department of Licenses, Capitol Bldg., Olympia.

Wisconsin.....Mr. William H. Barber, 621 Ransom St., Ripon.

NATIONAL BOARD OF MEDICAL EXAMINERS

The National Board of Medical Examiners is a voluntary and unofficial examining agency, the purpose of which is to prepare and to administer qualifying examinations of such high quality that

TABLE 38.—*Applicants Examined in Basic Sciences, 1958*

	Examined	Passed	Failed	% Failed
Alaska	1	1	*	..
Arizona	57	57	*	..
Arkansas	606	416	280	40.4
Colorado	155	155	*	..
Connecticut	219	219	*	..
District of Columbia	30	21	9	30.0
Florida	666	666	*	..
Iowa	196	196	*	..
Kansas	115	115	*	..
Michigan	453	234	219	48.3
Minnesota	249	249	*	..
Nebraska	50	42	8	16.0
Nevada	101	69	32	31.7
New Mexico	85	85	*	..
Oklahoma	83	64	19	22.9
Oregon	101	101	*	..
Rhode Island	127	109	18	14.2
South Dakota	55	55	*	..
Tennessee	157	149	8	5.1
Texas	220	220	*	..
Washington	117	89	28	23.9
Wisconsin	538	261	277	51.5
Total	4,000	3,592	1,008	21.9

* Failure data not reported.

TABLE 39.—*Basic Science Certificates Issued by Examination, Reciprocity, Endorsement, Exemption, or Waiver, 1958*

	Certified by		
	Examination	Reciprocity, Endorsement, Exemption, or Waiver	Total Certified
Alaska	1	21	22
Arizona	57	112	169
Arkansas	416	40	456
Colorado	155	122	277
Connecticut	219	121	340
District of Columbia	21	187	208
Florida	666	0	666
Iowa	196	110	306
Kansas	115	99	214
Michigan	234	337	571
Minnesota	249	167	416
Nebraska	42	29	71
Nevada	69	30	99
New Mexico	85	54	139
Oklahoma	64	1	65
Oregon	101	76	177
Rhode Island	109	2	111
South Dakota	55	26	81
Tennessee	149	110	259
Texas	220	502	741
Washington	89	284	373
Wisconsin	261	247	508
Total	3,592	2,677	6,269

legal agencies governing the practice of medicine within each state may at their discretion grant successful candidates a license without further examination.

It is the function of the individual states to determine who shall practice within their borders and to maintain high standards of medical practice in

accordance with their own rules and regulations. In recognition of the thoroughness and widely accepted standards of the National Board examinations, its certificate is accepted as a suitable qualification for the practice of medicine by 46 licensing authorities in the states, the District of Columbia, and the territories of the United States. A number of the boards of examiners in the basic sciences accept the examination of the National Board of Medical Examiners in lieu of their own examination.

The examinations are divided into three separate parts. Examinations in parts 1 and 2 are held at approved medical centers in the United States and Canada. Part 3 is administered by examining boards in 37 centers throughout the United States.

TABLE 40.—*Candidates for Basic Science Certification, 1927-1958*

	No. of Boards	Examination			Reciprocity, Endorsement, Exemption, or Waiver	Total Certified
		Passed	Failed	% Failed		
1927	5	294	33	10.0	27	321
1928	5	617	88	12.4	19	636
1929	7	641	93	12.6	75	716
1930	7	636	127	16.6	122	758
1931	7	634	153	19.4	141	775
1932	7	634	101	13.7	118	752
1933	8	557	104	15.7	131	688
1934	9	751	115	13.3	138	889
1935	10	794	162	16.8	114	908
1936	10	917	181	16.4	243	1,160
1937	12	1,102	242	18.0	202	1,304
1938	12	1,086	220	17.3	293	1,379
1939	14	1,110	249	18.3	1,021	2,131
1940	16	1,293	290	18.3	346	1,639
1941	17	1,751	373	17.5	353	2,104
1942	17	1,725	497	22.3	304	2,029
1943	18	2,389	410	15.1	302	2,691
1944	18	2,144	605	22.0	309	2,453
1945	18	2,339	634	21.3	584	2,923
1946	19	2,558	692	21.2	1,474	4,032
1947	19	2,633	905	25.6	900	3,533
1948	19	3,038	760	20.6	1,418	4,456
1949	20	3,656	1,515	29.5	1,480	5,136
1950	20	3,439	1,340	28.1	2,516	5,956
1951	21	3,198	735	18.7	1,939	5,137
1952	21	3,806	1,346	26.1	1,924	4,730
1953	21	3,854	1,220	24.0	1,899	5,753
1954	21	3,941	874	18.2	1,976	5,917
1955	21	3,474	447	11.1	1,936	5,410
1956	21	3,734	741	16.6	2,373	6,107
1957	22	4,024	842	17.3	2,283	6,307
1958	22	3,592	1,008	21.9	2,677	6,269
Total		69,282	17,141	20.5	29,787	95,069

TABLE 41.—*Basic Science Registration Fees*

Alaska	$25	Nebraska	$10
Arizona	20	Nevada	25
Arkansas	10[a]	New Mexico	50[d]
Colorado	25	Oklahoma	15[b]
Connecticut	25	Oregon	25
District of Columbia	25	Rhode Island	10
Florida	10	South Dakota	15
Iowa	10	Tennessee	25
Kansas	25	Texas	15[b]
Michigan	10	Washington	10
Minnesota	25[c]	Wisconsin	10

Fee for registration without examination: [a] $25; [b] $50; [c] $20, nonresidents; $25 reciprocity; [d] $75, reciprocity; $12.50 reexamination per subject; [e] $50, reciprocity; $10 reexamination.

The National Board admits to its examinations any student or graduate of an approved medical school in the United States or Canada. A candidate is eligible for part 1 who has completed the formal courses of the first two years in an approved medical school; eligibility for part 2 calls for completion of a four-year medical course in an approved medical school; a candidate is eligible for part 3 if he has passed parts 1 and 2, received a degree of doctor of medicine, and served at least one year in an approved hospital internship.

Although previously accepting graduates of certain foreign medical schools, the National Board does not, at the present time, admit to its examinations leading to certification any graduates of medical schools outside the United States and its territories and Canada.

Upon receipt of a request initiated by a state licensing board, a specialty board, or a medical school, an individual may be admitted to certain National Board examinations in order to satisfy special requirements or regulations of the licensing board, specialty board, or the medical school. In such cases the individual is not considered a can-

TABLE 42.—*National Board Examinations in Part 1, 1922-1958*

Date	Total Examinations	Passed	Incomplete	Failed	% Failed
June, 1958	3,161	2,074	810	277	11.8
September, 1958	1,049	369	629	60	14.0
Total	4,210	2,443	1,439	337	12.1
1922	388	293	28	67	20.3
1923	507	349	77	81	18.8
1924	591	415	69	107	20.5
1925	698	460	50	158	28.3
1926	625	436	104	85	16.3
1927	702	452	159	91	16.8
1928	843	533	231	79	12.9
1929	1,086	675	331	90	11.8
1930	1,260	801	345	114	12.5
1931	1,277	755	425	97	11.4
1932	1,307	817	371	89	9.5
1933	1,234	702	316	136	14.8
1934	1,241	809	347	85	9.5
1935	1,264	765	410	89	8.1
1936	1,344	856	363	123	12.5
1937	1,435	871	415	149	14.6
1938	1,654	986	508	160	14.0
1939	1,733	1,048	460	225	17.7
1940	1,653	1,069	375	209	16.4
1941	1,640	1,067	346	207	16.0
1942	1,867	1,304	471	192	13.8
1943	2,656	1,441	902	253	14.9
1944	4,229	2,326	1,465	438	15.9
1945	3,865	2,108	1,475	284	11.8
1946	3,148	1,695	1,189	264	13.5
1947	3,514	1,844	1,352	318	14.7
1948	3,807	2,178	1,202	307	14.4
1949	3,923	2,337	1,243	243	9.4
1950	3,678	2,358	986	334	9.0
1951	3,520	2,153	1,038	329	9.3
1952	3,980	2,467	1,147	375	9.4
1953	4,278	2,906	980	432	13.0
1954	3,552	2,286	677	289	11.2
1955	3,196	1,735	1,173	288	14.2
1956	3,475	2,075	510	290	10.8
1957	3,816	2,281	1,211	224	8.9
1958	4,210	2,443	1,430	337	12.1
Totals	82,725	50,636	24,431	7,678	13.2

didate for National Board certification. He is admitted to the examinations as a service to the board or school initiating the request and the grades are, therefore, sent only to the board or school concerned.

An increasing number of medical schools are finding National Board examinations useful as an impartial evaluation of their students in comparison with students of other schools. A medical school may use the National Board examinations for an entire class of students when the school wishes to have an objective extramural test in individual subjects or as a comprehensive examination. Twenty-nine medical schools are using to some degree the services of the National Board of Medical Examiners. Medical schools may also request that a foreign medical student who is being considered for admission to advanced standing be permitted to take National Board examinations in order to determine the level of his medical knowledge.

The most notable addition to the services rendered by the National Board is the preparation and administration of the examinations of the Educational Council for Foreign Medical Graduates.

The written examinations of parts 1 and 2 all are of the objective, multiple-choice type and may be taken by students during the course of their training in the medical school. Each of the six examinations of part 1 and part 2 is developed by a separate committee which is appointed by the Board and consists of about six members, including department heads, teachers, and clinicians with recognized prominence in their own fields. These committees have wide geographic distribution. Part 3 is a clinical and practical examination of the candidate's ability in critical observation, in diagnostic acumen, and in the principles of therapy. The examination is divided into four periods allocated to the four major elements of general practice. In addition, essay type examinations are included in the clinical subjects of part 3.

Examinations in part 1 were held during 1958 in June and September and in part 2 in April and June. The part 3 examination is given in late June with a small limited interim examination in the late fall.

The tables that are presented refer to the results of examinations in all three parts since 1922, including the number who passed and failed examination and the number certified. This is the 37th annual compilation of these statistics. The board's first examination was given in October, 1916. From that date and up to and including a test given in June, 1921, 11 examinations were given and 268 candidates were certified. Since 1922 the examination has been divided into three parts.

Tables 42 and 43 record the results of examinations given in parts 1 and 2 during 1958 and for each year since 1922. The data shown in these

TABLE 43.—*National Board Examinations in Part 2, 1922-1958*

Date	Total Examinations	Passed	Incomplete	Failed	% Failed
April, 1958	2,388	2,328	5	60	2.5
June, 1958	537	212	10	4	1.8
Totals	2,925	2,540	15	64	2.4
1922	109	90	0	19	17.4
1923	192	170	2	20	10.5
1924	267	227	0	40	15.0
1925	342	309	0	33	9.6
1926	381	334	1	46	12.1
1927	361	314	1	46	12.8
1928	410	371	1	38	9.3
1929	465	399	19	47	10.5
1930	629	543	7	79	11.4
1931	719	630	2	87	12.1
1932	737	674	0	58	7.9
1933	714	651	0	63	8.8
1934	633	583	0	50	7.9
1935	689	620	0	69	10.0
1936	708	716	2	50	6.5
1937	855	803	1	51	6.0
1938	861	815	0	46	5.3
1939	938	884	0	54	5.8
1940	1,028	963	9	56	5.5
1941	1,091	954	1	46	4.6
1942	1,072	1,031	0	41	3.8
1943	1,861	1,805	0	56	3.0
1944	1,405	1,350	0	55	3.9
1945	1,520	1,505	0	34	2.1
1946	1,825	1,782	0	43	2.4
1947	1,641	1,613	0	28	1.7
1948	1,742	1,725	0	17	0.9
1949	1,787	1,691	0	46	2.6
1950	1,863	1,837	0	26	1.3
1951	2,045	2,017	0	28	1.4
1952	2,017	2,001	0	16	0.8
1953	2,300	2,145	1	54	2.4
1954	2,258	2,169	26	63	2.8
1955	2,270	2,181	3	36	1.6
1956	2,182	2,153	3	26	1.2
1957	2,151	2,115	18	18	0.8
1958	2,925	2,540	15	64	2.5
Totals	44,528	42,770	112	1,646	3.7

TABLE 44.—*National Board Examinations in Part 3, 1922-1958*

Year	Total Examinations	Passed	Failed	% Failed
1922	22	22	0	0.0
1923	82	81	1	1.2
1924	126	120	6	4.8
1925	219	206	13	5.9
1926	255	243	12	4.7
1927	293	272	21	7.2
1928	322	306	16	5.0
1929	352	337	15	4.3
1930	420	401	19	4.5
1931	437	419	18	4.1
1932	550	522	28	5.1
1933	551	526	25	4.5
1934	567	548	19	3.4
1935	598	578	20	3.3
1936	576	547	29	5.0
1937	660	630	30	5.7
1938	706	682	24	3.4
1939	770	729	41	5.3
1940	792	771	21	2.7
1941	910	885	25	2.7
1942	1,054	1,041	13	1.2
1943	1,230	1,213	17	1.4
1944	1,168	1,146	22	1.8
1945	1,245	1,232	13	1.0
1946	1,634	1,613	21	1.2
1947	1,741	1,723	18	1.0
1948	1,715	1,700	15	0.9
1949	1,685	1,674	11	0.6
1950	1,752	1,736	16	0.9
1951	1,738	1,708	30	1.7
1952	2,128	2,090	92	4.3
1953	2,029	1,970	60	2.9
1954	2,132	2,052	81	3.8
1955	2,090	2,077	13	0.6
1956	2,085	2,072	13	0.6
1957	2,010	1,998	12	0.6
1958	2,023	2,011	12	0.6
Totals	38,086	37,536	850	2.2

tables represent examinations conducted rather than persons examined, and the figures thus include candidates who fail and are reexamined during the same year and those who may pass parts 1 and 2 in the same year. The examination in part 1, and occasionally in part 2, may be divided and taken at more than one examination period. Four or five subjects may be taken at one time and the remaining subjects of the part taken later. Candidates so examined during 1958 are listed in the tables under the heading of a column titled incomplete.

There were 4,210 examinations in part 1 given in 1958; 2,443 candidates passed, and 337, or 12.1%, failed. Incomplete examinations numbered 1,430. In part 2, 2,625 examinations were held, 2,540 passed, and 64, or 2.5%, failed. Fifteen incomplete examinations were given.

TABLE 45.—*Diplomates from Individual Medical Schools, 1958*

United States	
Medical College of Alabama	2
University of Arkansas	3
College of Medical Evangelists	39
University of California, Los Angeles	1
University of Southern California	1
Stanford University	21
University of California, San Francisco	1
University of Colorado	3
Yale University	75
Georgetown University	81
George Washington University	78
Howard University	5
University of Miami	12
Emory University	2
Chicago Medical School	66
Northwestern University	56
Stritch School of Medicine	43
University of Chicago	45
University of Illinois	18
State University of Iowa	3
University of Kansas	15
University of Louisville	8
Tulane University	7
Johns Hopkins University	8
University of Maryland	4
Boston University	68
Harvard Medical School	111
Tufts University Medical School	115
University of Michigan	4
Wayne State University	1
University of Minnesota	1
University of Missouri	3
St. Louis University	8
Washington University	10
Creighton University	27
University of Nebraska	3
Albany Medical College	49
University of Buffalo	66
Columbia University	107
Cornell University	76
New York Medical College	98
New York University	113
State University of New York, Brooklyn	145
University of Rochester	58
State University of New York, Syracuse	60
Duke University	7
Western Reserve University	41
Ohio State University	1
University of Oregon	17
Hahnemann Medical College of Philadelphia	9
Jefferson Medical College	11
Temple University	8
University of Pennsylvania	33
Woman's Medical College of Pennsylvania	18
University of Pittsburgh	2
University of Puerto Rico	23
University of Tennessee	1
Vanderbilt University	3
University of Texas	1
University of Utah	1
University of Vermont	30
Medical College of Virginia	4
University of Washington	6
University of Wisconsin	2
Marquette University	6
Total	1,569
United States (no longer in operation)	
Rush Medical College	1
Canada	
University of Alberta	1
University of British Columbia	2
University of Manitoba	3
Dalhousie University	1
Queen's University	3
University of Western Ontario	2
University of Ottawa	9
University of Toronto	2
McGill University	40
Total	63
Foreign	
University of Havana, Cuba	1
University of London, England	1
University of Teheran, Iran	1
American University of Beirut, Lebanon	1
University of Leiden, Netherlands	2
University of Lausanne, Switzerland	2
Total	8

From 1922 to 1958, inclusive, a total of 82,725 examinations have been given in part 1 and 44,528 in part 2. In the 37-year period shown, there have been 7,678 failures in part 1 (13.2%), and 1,640 (3.7%) in part 2.

In 1958, 2,023 tests were given in part 3; 2,011 candidates passed and 12 (0.5%) failed. Results of examinations in part 3 in 1958 and in the 36 preceding years are given in table 44. In the 37-year period 38,686 were tested, of whom 37,836 were granted the certificate of the board. The percentage of failures in the board's final examination for this period was 2.2.

The 2,011 physicians certified as diplomates in 1958 represented 65 medical schools in the United States and Puerto Rico, one United States medical school no longer in operation, 9 in Canada, and 6 schools in other countries. The school and the number of examinees from each are included in table 45.

TABLE 46.—*Licenses Granted on the Basis of National Board Certificates, 1958*

Alabama	6	New Hampshire	16
Alaska	5	New Jersey	144
Arizona	19	New Mexico	5
California	608	New York	984
Colorado	20	North Dakota	5
Connecticut	101	Ohio	92
Delaware	4	Oklahoma	6
District of Columbia	71	Oregon	25
Georgia	15	Pennsylvania	129
Idaho	4	Rhode Island	15
Illinois	85	South Carolina	4
Iowa	18	South Dakota	3
Kansas	6	Tennessee	14
Kentucky	22	Utah	13
Maine	21	Vermont	20
Maryland	90	Virginia	47
Massachusetts	282	Washington	48
Michigan	22	West Virginia	11
Minnesota	52	Wisconsin	29
Mississippi	3	Wyoming	2
Missouri	33	Hawaii and Puerto Rico	47
Montana	9	Totals	3,215
Nebraska	2		
Nevada	7		

In 1958, there were 3,215 licenses to practice medicine issued by endorsement of the certificate of the National Board of Medical Examiners in 43 states, the District of Columbia, Hawaii, and Puerto Rico. The number registered by each of these licensing boards is recorded in table 46. There have been 41,670 licenses issued on the basis of endorsement of the certificate of the National Board of Medical Examiners since 1915.

In 1958, there were 464 medical students who took part 1 and 889 who took part 2, not as candidates for National Board certification but only as a requirement of their own medical school. During the year, also, a total of 54 individuals who had two or more years of medical education in a foreign medical school and who were being considered for admission to a medical school in the United States were examined in either part 1 or part 2.

The National Board allows one reexamination in the event of failing a part. If a candidate fails for a second time, permission to take the examination for a third time is given only by special permission of the board and only if the candidate can demonstrate to the satisfaction of the board that there are special reasons justifying examination.

The corresponding officer of the National Board of Medical Examiners is Dr. John P. Hubbard, Executive Secretary and Treasurer. The address of the board is 133 S. 36th St., Philadelphia 4.

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MEDICINE AND THE LAW

LIABILITY OF GOVERNMENTAL HOSPITALS FOR NEGLIGENCE

"The King can do no wrong!" This is the legal maxim which prevailed under English common law. The American common law adopted the principle of sovereign immunity, investing the state and federal governments with the royal privileges. Hence, state and federal governmental units have generally enjoyed a freedom from suits based upon negligence.

By statute, the sovereign immunity has been diminished in many instances, thus allowing certain kinds of suits against governmental agencies. Such action, of itself, does not necessarily make for liability unless the courts interpret these statutes, or other laws of the jurisdiction, as allowing governmental subdivisions to be liable for the negligence of their employees or agents.

The federal government hospitals remained immune from liability until the Federal Tort Claims Act waived the sovereign protection. Similarly, hospitals operated by states have retained their cloak of immunity unless the common law rule has been abrogated by statute.

Counties and municipalities do not fit so clearly into the traditional concepts of sovereign immunity. Most courts, however, have considered counties and cities to be instrumentalities created by the state legislatures and entitled to the benefits of the immunity of the parent body. This does not mean that city and county hospitals automatically enjoy the immunity which might apply, for example, to a fire department. In fact, some courts have distinguished the functions of a governmental unit created by a state and have determined that certain activities are governmental in nature, that is, are required for performance of the government's purposes, while other activities are proprietary, i. e., similar to or competitive with private business.

Whether operation of a hospital by a city or county is a governmental or a proprietary activity determines, in many jurisdictions, whether the hospital will enjoy immunity from liability for negligence. It is more of a legal conclusion than a factual finding, however, since the same activity may be considered governmental in one state and proprietary in another. This distinction constitutes the basis for the prevailing theory. There are numerous additional or subordinate theses, however. For instance:

In a few states the courts have concluded that if voluntary nonprofit hospitals enjoy charitable immunity, the governmental hospitals should also be immune from liability.

If a statute permits a governmental unit to operate a hospital but does not make this activity a mandatory one, a number of courts have held that the hospital, nevertheless, is clothed with sovereign immunity.

A few cases indicate that a county, as distinguished from a municipal corporation, is clearly performing a governmental function when it operates a hospital, and thus deserves to be free from liability.

Some courts felt so strongly about governmental immunity that they have supported it even upon a showing of gross negligence or wanton disregard for the safety of others.

Although the incorporation statute or its charter may allow a governmental unit to sue and be sued, courts have often held that this does not affect the immunity from liability for negligence enjoyed by governmental hospitals; the suit must be for some reason other than negligence, unless such immunity has been specifically waived.

If the corporate charter, or other legislative action by which the governmental hospital was authorized, enumerates the powers granted, and the injury complained of resulted from an activity not specifically authorized, most courts have held that the hospital continues to be immune; an act outside the apparent scope of authority does not customarily threaten liability for a governmental hospital.

Even if a governmental hospital acquires liability insurance as a precautionary measure, its immunity should not be affected, some courts hold.

In a number of states governmental hospitals have been held liable. The rationale of the courts has included these views:

If it is not mandatory for the governmental unit to operate a hospital, such activity is not considered governmental but rather is proprietary and governmental immunity is not applicable.

Receiving paying patients is inconsistent with a governmental function, hence there should be liability at least insofar as paying patients are concerned.

If voluntary nonprofit hospitals are liable in the state, governmental hospitals should be in no different position.

If the hospital has purchased liability insurance, immunity is waived at least to the extent of insurance coverage.

In the realm of voluntary nongovernmental hospitals, there is an unmistakable trend away from immunity and toward liability. Many states, through court decisions, have switched in the past few years. The courts in these states have decried charitable immunity as an anachronism out of step with contemporary concepts of justice. To a lesser extent, the courts have also been saying that governmental immunity in the hospital field is a harsh doctrine and should be set aside since the reasons for this rule also no longer exist; now that government is engaged in so many ventures which have not been included in its traditional functions, liability would be more appropriate.

The courts have not been in a position to reverse the immunity holdings relative to governmental hospitals as readily as with voluntary institutions, however. It is generally recognized that

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This material was prepared by the Joint Committee on Professional Liability of the American Medical Association and the American Hospital Association.

legislative action is necessary to remove governmental immunity once the immunity has been established. This has been done in New York state via the Court of Claims Act, by the Federal Tort Claims Act for United States hospitals, and through interpretation of the Hospital Authority Act in Georgia.

There is a trend toward liability in governmental hospitals. Some recent court decisions in states which have considered the question for the first time indicate this, and further legislative action may be expected in other states. Insurance coverage to protect against this liability is generally available both for the hospital and for its employees (who, in any case, might be personally liable even if the hospital enjoys immunity).

CHART SHOWING TORT LIABILITY OF GOVERNMENTAL HOSPITALS TO PATIENTS

(Unless commented upon, it may be assumed that state owned institutions are immune from tort liability.)

ALABAMA

A public hospital corporation such as a county hospital, authorized by statute, performs a governmental function and is *immune* from liability to indigent or paying patients. *Garret v. Escambia County Hospital Bd.*, 94 So. 2d 762 (Ala., 1957).

ALASKA

Political subdivisions are *liable* for the negligence of their servants in operating hospitals to the same extent as private individuals, *Tuengel v. Sitka*, 118 F. Supp. 399 (D.C., Alaska, 1954), and possibly the state is liable as well under a special statute. Alaska Comp. Laws. Ann. §§ 56-7-1, 56-7-7 (Supp. 1958).

ARIZONA

A county hospital is engaged in a governmental function and is *immune* from negligence liability. *Lee v. Dunklee*, 326 P. 2d 1117 (Ariz., 1958).

ARKANSAS

No cases reported.

CALIFORNIA

County hospitals are *immune* from liability for "malpractice" injuries arising out of their operation, *Calkins v. Newton*, 36 Cal. App. 2d 262, 97 P. 2d 523 (1940); "District Hospitals" are likewise *immune* from liability, even to paying patients, *Talley v. Northern San Diego County Hospital District*, 41 Cal. 2d 33, 257 P. 2d 22 (1953). There is *liability*, however for dangerous or defective condition of county hospital property, *Burns v. American Casualty Co.*, 127 Cal. App. 2d 198, 273 P. 2d 605 (1954); and probably *liability* to paying patients in municipal hospitals, *Beard v. City and County of San Francisco*, 79 Cal. App. 2d 753, 180 P. 2d 744 (1947).

COLORADO

City and county hospitals are engaged in governmental activities and are thus *immune* from tort liability. *Schwalb v. Connely*, 116 Colo. 195, 179 P. 2d 667 (1947).

CONNECTICUT

No cases reported.

DELAWARE

No cases reported, but sovereign immunity is waived, by statute, if liability insurance exists. Del. Code Ann. Title 18 § 516 (Supp. 1958).

DISTRICT OF COLUMBIA

Federally owned hospitals would be *liable* within the provisions of the Federal Tort Claims Act. See discussion under "Federal" Hospitals owned by the District retain tort *immunity*. *Calomeris v. District of Columbia*, 125 F. Supp. 266 (D.C.D.C., 1954).

FLORIDA

A city is *liable* for negligent injuries received by a patient. *Goff v. Ft. Lauderdale*, 65 So. 2d 1 (Fla., 1953). County hospital is liable also. *Bourgeois v. Dade County*, 99 So. 2d 575 (Fla., 1957).

GEORGIA

A hospital organized under the Hospital Authority Act is *liable* for its torts. *Hall v. Hospital Authority of Floyd County*, 99 S.E. 2d 708 (Ga. App., 1957).

HAWAII

No reported cases. Federal hospitals would be *liable* within the provisions of the Federal Tort Claims Act. See discussion under "Federal."

IDAHO

Where a county is required by law to provide hospital care only for the indigent, there is *liability* to paying patients in a county hospital. *Henderson v. Twin Falls County*, 56 Idaho 124, 50 P. 2d 597 (1935). Also, by statute, state hospitals are liable to the extent of their insurance coverage. Id. Code §§ 41-3304, 3305 (Supp. 1957).

ILLINOIS

A government-owned hospital is devoted to public purposes and is *immune* from liability in absence of statutory provision to the contrary. *Olander v. Johnson*, 258 Ill. App. 89 (1930). A city-owned hospital is also *immune* either as a charity or because it promotes the public welfare under the general police powers. *Tollefson v. Ottawa*, 228 Ill. 134, 81 N.E. 823 (1907).

INDIANA

A city hospital performs a governmental function and is *immune* from tort liability. *Scott v. Indianapolis*, 75 Ind. App. 387, 130 N.E. 658 (1921).

IOWA

A county hospital is a proprietary function, at least insofar as paying patients are concerned; hence *liability* to paying patients. *Wittmer v. Letts*, 80 N.W. 2d 561 (Iowa, 1957).

KANSAS

Activities of a city hospital are proprietary and give rise to *liability* to a paying patient. *Stolp v. Arkansas City*, 180 Kan. 197, 303 P. 2d 123 (1956).

KENTUCKY

A city hospital performs a governmental function and is *immune* from liability for negligence. *Van Pelt v. Louisville*, 257 Ky. 256, 77 S.W. 2d 942 (1934). A Board of Claims hears claims against the state for negligent acts and may pay up to $10,000. Ky. Rev. Stat. Ann. § 44.070 (Supp. 1958).

LOUISIANA

Operation of a hospital by a governmental unit is a governmental activity and *immune* from tort liability. *Messina v. Societe Francaise De Bienfaissance*, 170 So. 801 (La. App., 1936). If a governmental hospital is covered by liability insurance, the insurer possibly may be liable to the amount of insurance.

MAINE

A hospital operated under legislative authority generally is *immune*, except for *liability* to paying patients. *Anderson v. Portland*, 130 Me. 214, 154 A. 572 (1931).

MARYLAND

Governmental *immunity* applies to governmental hospitals. *Thomas v. Board of County Commissioners*, 92 A. 2d 452 (Md. App., 1952). Whether a governmental hospital, if insured, is subject to tort liability to the extent of its coverage has not yet been determined. Ann. Code of Md., Art. 48A, § 85 (1957).

MASSACHUSETTS

A city hospital is *immune* from tort liability even if there has been gross negligence. *Young v. Worcester*, 253 Mass. 431, 149 N.E. 204 (1925).

MICHIGAN

City hospitals are *immune* as a governmental function. *Martinson v. Alpena*, 328 Mich. 595, 44 N.W. 2d 148 (1950); general charitable *immunity* also applies to govern-

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ment charitable functions such as a state university hospital. *Robinson v. Washtenaw Circuit Judge*, 228 Mich. 225, 199 N.W. 618 (1924).

MINNESOTA

A government agency is *liable* for negligence in its proprietary functions, which would include operation of a general hospital. *Swigerd v. Ortonville*, 75 N.W. 2d 217 (Minn., 1956); *Borwege v. Owatonna*, 190 Minn. 394, 251 N.W. 915 (1933).

MISSISSIPPI

Operation of a hospital by a governmental unit is considered a government function, hence *immunity* from tort liability. *Jones v. Amory*, 184 Miss. 161, 185 So. 237 (1939). No liability to paying patients, either. *Leland v. Leach*, 86 So. 2d 383 (Miss. 1956).

MISSOURI

Operation of a hospital is a proper function of government and brings *immunity*. *Schroeder v. City of St. Louis*, 360 Mo. 293, 228 S.W. 2d 677 (1950).

MONTANA

No cases reported.

NEBRASKA

No cases reported.

NEVADA

County hospital created under statute is not a legal entity and cannot be sued for negligence. *Bloom v. Southern Nevada Memorial Hospital*, 275 P. 2d 885 (Nev., 1954). Whether the county itself is responsible for hospital torts is not yet determined.

NEW HAMPSHIRE

Operation of a hospital by a city, under legislative authority, is considered a proprietary activity and is subject to tort *liability*. *Kardulas v. Dover*, 99 N.H. 359, 111 A. 2d 327 (1955).

NEW JERSEY

Immunity from liability for government hospitals, except that in cases of "active wrongdoing" or "positive misfeasance," as contrasted with ordinary negligence, there is liability. *Kress v. Newark*, 8 N.J. 562, 86 A. 2d 185 (1952).

NEW MEXICO

Operation of a governmental hospital is a governmental function; county hospital is *immune* from tort liability. *Elliott v. Lea County*, 58 N.W. 147, 267 P. 2d 131 (1954).

NEW YORK

Under Section 8, Court of Claims Act, the state waives its immunity. *Liability* of state, county, town, city and village hospitals is determined as if they were private individuals or corporations. *Becker v. City of New York*, 2 N.Y. 2d 226, 140 N.E. 2d 262 (1957). There is also *liability* of municipal corporations for the malpractice of doctors or dentists occurring in municipal hospitals if the professional services are rendered gratuitously in a charity case. Section 50-d, New York General Municipal Law (1956).

NORTH CAROLINA

Governmental *immunity* applies even to paying patients in a city-county hospital. *Hutchings v. Albemarle Hospital*, 220 F. 2d 716 (CA 4th, N.C., 1955). The state is liable up to $10,000, under a special statute, for negligent acts. Gen. Stat. of N. C. § 143-291 (1958).

NORTH DAKOTA

No cases reported.

OHIO

Municipally operated hospitals promote the public health, constitute a governmental function, and are *immune* from tort liability. *Lloyd v. Toledo*, 42 Ohio App. 36, 180 N.E. 716 (1931).

OKLAHOMA

A city hospital is a proprietary activity and is subject to tort *liability*. *Okmulgee v. Carlton*, 180 Okla. 605, 71 P. 2d 722 (1937).

OREGON

No cases reported.

PENNSYLVANIA

Immunity of governmental hospitals in Pennsylvania is a long standing rule of law. *Hand v. Philadelphia*, 8 Pa. Co. 213 (1890).

PUERTO RICO

The governmental nature of a public municipal hospital brings *immunity* from tort liability. *Villegas v. San Juan*, 19 P.R. 397 (1913).

RHODE ISLAND

No cases reported.

SOUTH CAROLINA

Governmental hospitals are *immune* from tort liability in absence of a statute to the contrary. *Mullins Hospital v. Squires*, 104 S.E. 2d 161 (S.C., 1958).

SOUTH DAKOTA

County functions, such as operating a hospital, are clothed with governmental *immunity*. *Jerauld County v. St. Paul-Mercury Indemnity Co.*, 71 N.W. 2d 571 (S.D., 1955).

TENNESSEE

Governmental hospitals derive an *immunity* from tort liability because they constitute a governmental function. *Lane v. Knoxville*, 170 Tenn. 482, 98 S.W. 2d 769 (1936). If covered by liability insurance, a municipal hospital waives immunity to the extent of coverage. *McMahon v. Baroness Erlanger Hospital*, 308 S.W. 2d 41 (Tenn. App., 1957).

UTAH

No cases reported.

VERMONT

No cases reported.

VIRGINIA

There is *immunity* from tort liability for governmental hospitals created under statutory authority. *Maia v. Eastern State Hospital*, 97 Va. 507, 34 S.E. 617 (1899).

WASHINGTON

By statute there is *immunity* for governmental hospitals from liability for the negligence of employees, agents, and officers. *Gile v. Kennewick, Public Hospital District*, 48 Wash. 2d 774, 296 P. 2d 662 (1956).

WEST VIRGINIA

A county hospital authorized by statute is a governmental activity and is *immune* from liability for negligence. *Shaffer v. Monongalia General Hospital*, 135 W. Va. 163, 62 S.E. 2d 795 (1950).

WISCONSIN

Governmental hospitals are *liable* for their proprietary functions. *Carlson v. Marinette County*, 264 Wis. 423, 59 N.W. 2d 486 (1953).

WYOMING

No cases reported.

FEDERAL

The Federal Tort Claims Act, 28 USC 2671 et. seq., provides for *liability* of the United States (except for interest prior to judgment and punitive damages) "in the same manner and to the same extent as a private individual under like circumstances." While the law of the place of injury usually governs, any governmental immunity in a state would be ignored since "private individuals" do not enjoy such immunity. Malpractice by a physician employed by the United States would be actionable against the United States. *Dishman v. U. S.*, 93 F. Supp. 567 (D.C. Md., 1950), except where the injured person is a serviceman treated as an "incident to the service." *Feres v. U. S.*, 340 U.S. 135 (1950).

FOREIGN

In England and Canada, where the general system of law is similar to that of the United States, a governmental body operating a hospital is liable for negligence just as a private individual or corporation would be under similar circumstances. *Cassidy v. Ministry of Health*, 2 K.B. 343 (1951) [Great Britain]; *Nyberg v. Provost Municipal Hospital Board*, Can. S.C.R. 226 (1927) [Canada].

This article is being published simultaneously in the June 1 issue of *Hospitals*.

MEDICAL NEWS

CALIFORNIA

Dr. Allen Named Department Head.—Dr. J. Garrott Allen, University of Chicago, was named to head the Stanford University Medical School's department of surgery. Dr. Allen will commence his new duties on July 1, just prior to the opening of the Medical School's new 22-million-dollar facilities nearing completion on the Palo Alto campus. He is professor of surgery and attending surgeon at the University of Chicago Clinics, where he has served continuously since 1938.

Dr. Whalman Honored.—Dr. Harold F. Whalman, chairman of ophthalmology at the College of Medical Evangelists, Los Angeles, will receive the Distinguished Nevadan Award during commencement ceremonies at the University of Nevada on June 1, "in recognition of [his] significant contribution to the scientific and social advancement of our nation." Dr. Whalman received his bachelor of arts degree from the University of Nevada in 1922. Since 1935, he has been a member of the faculty at the College of Medical Evangelists.

ILLINOIS

Mental Health Observance.—Governor William G. Stratton proclaimed the period April 26 to May 19 as "Eleventh Annual Mental Health Observance in Illinois." Governor Stratton's official proclamation urged "all citizens to join in the observance, visiting a state mental institution if possible, to the end that public awareness of the problem will stimulate the enlightened public action essential to a solution." More than 100 public and private agencies and organizations joined the Illinois Department of Public Welfare as co-sponsors of the statewide observance. The 11th annual Mental Health Dinner was held in Springfield May 19, featuring Dr. Robert H. Felix, director, National Institute for Mental Health, as guest speaker.

Chicago

Meeting of Rush Alumni.—The Alumni Association of Rush Medical College will hold a meeting June 9, 12:30 p. m., at the Shelburne Hotel, Atlantic City, N. J., under the presidency of Dr. Lowell D. Snorf, Chicago. For information, write Dr. James W. Merricks, Secretary, Alumni Association of Rush Medical College, 1758 W. Harrison St., Chicago 12. Luncheon fee is $5.

Physicians are invited to send to this department items of news of general interest, for example, those relating to society activities, new hospitals, education, and public health. Programs should be received at least three weeks before the date of meeting.

Personal.—Dr. John A. D. Cooper, professor of biochemistry, was named associate dean of Northwestern University Medical School. Since 1956, Dr. Cooper has been assistant dean. Dr. Cooper organized a course on the application of nuclear physics in biology and medicine which he first taught in 1949, reportedly the first of its kind offered in medical schools.——John H. Rust, D.V.M., project director, department of food technology, Massachusetts Institute of Technology, Cambridge, was made head of the newly established Section on Nuclear Medicine at the University of Chicago's School of Medicine.

MASSACHUSETTS

Annual Lecture.—Dr. James H. Means, Jackson Professor of Clinical Medicine, Emeritus, at Harvard and former chief of medical services at the Massachusetts General Hospital, delivered the annual Gay Lecture on Medical Ethics at the Harvard Medical School, Boston, on "Profession or Business" May 13. The Gay Lectures were established at Harvard in 1917 by Dr. George W. Gay, a graduate of Harvard Medical School.

Medical Center Established.—Formation of a Boston University–Massachusetts Memorial Hospitals Medical Center, to continue and enlarge "the cooperative enterprises of the two institutions in the advancement of patient care, of education in medicine and other health services, and of research," was announced May 2 by President Harold C. Case, of Boston University. The move converts to a formal association the informal cooperation which has existed over a period of years between the Boston University School of Medicine and its principal teaching hospital, the Massachusetts Memorial, located in Boston's South End. The Medical Center will be governed by a joint administrative board, composed of the presidents and three representatives each from the trustees of the university and the hospitals and a member-at-large elected by the other eight. The board will have over-all supervision of the Medical Center, including medical education, medical care, research, and any other training programs conducted by any unit of the center. A full-time director of the medical center, who will serve as chief executive officer of the board and the center, will be appointed. The cost of establishing the center and paying for the services of the director and the expenses of his office will be shared equally by the university and the hospitals, President Case said. The offices of dean of the School of Medicine

and administrator of the hospitals will continue, and final authority for the program of each institution will remain with its respective board of trustees.

MINNESOTA

Dr. Pruitt Goes to Texas.—Dr. Raymond D. Pruitt, a consultant in internal medicine in the Mayo Clinic since 1943, associate director of the Mayo Foundation from 1954 to 1956, and professor of medicine in the Mayo Foundation, Graduate School, University of Minnesota, will leave that institution on July 1 to become chairman, department of medicine, Baylor University College of Medicine, Houston, Texas. The appointment includes assignment as physician-in-chief to the Jefferson Davis Hospital and chief consultant in medicine to the Veterans Administration Hospital, Houston.

MONTANA

New President.—Dr. Thaddeus L. Lockridge, Whitefish, succeeded to the office of president of the Flathead County Medical Society and will complete the unexpired term of Dr. Kenneth J. Lampert, who is moving to New Mexico to join the staff of the New Mexico Hospital for Retarded Children.

Society News.—The annual meeting of the Montana Society of Pathologists was held Feb. 7, 1959, in Butte. Newly elected officers for the present year are: president, Dr. Ernst J. Eichwald, of the Montana Deaconess Hospital, Great Falls, and secretary-treasurer, Dr. John P. Pfaff, of Columbus Hospital, Great Falls.

Rehabilitation Meeting.—The 1959 annual meeting of the Montana Association for Rehabilitation, under the presidency of Dr. Jesse T. Schwidde, will be held in Billings, June 17-18, at Marillac Hall. The theme will be "Rehabilitation in Action," and the program will include progress reports from various areas and agencies in the state as well as the annual business meeting. The scientific program will include clinical evaluation demonstrations, pediatric rehabilitation problems, geriatrics, and a discussion of osteoarthritis and paraplegic cases. Dr. Howard A. Rusk, chairman, department of physical medicine and rehabilitation, New York University–Bellevue Medical Center, and Dr. Ross T. McIntyre, executive director, International College of Surgeons, will participate. Also included on the program will be a tour of the new rehabilitation unit of St. Vincent's Hospital, Billings. On Thursday evening, June 18, the association will hold its annual banquet at the Northern Hotel at 7:30 p. m.

NEW HAMPSHIRE

Dr. Lobitz Goes to Oregon.—Dr. Walter C. Lobitz Jr., professor of dermatology, Dartmouth Medical School, and chief of the department of dermatology at Hitchcock Clinic in Hanover, was named professor and head of the division of dermatology at the University of Oregon Medical School, Portland, effective July 1. He succeeds Dr. Thomas B. Fitzpatrick, who accepted a similar position at Harvard University Medical School, Boston. Dr. Lobitz was a fellow in dermatology and syphilology at the Mayo Foundation from 1942 to 1945 and became a diplomate of the American Board of Dermatology in 1947.

OHIO

State Medical Election.—Dr. Frank H. Mayfield, Cincinnati neurosurgeon, was installed as president of the 113-year-old Ohio State Medical Association April 23, and Dr. Edwin H. Artman, Chillicothe general practitioner, was selected as president-elect. Dr. Artman will be installed as president at the 1960 annual meeting in Cleveland. Retiring president was Dr. George A. Woodhouse, Pleasant Hill general practitioner. Elected to serve on the Council are Dr. Ray M. Turner, Springfield; Dr. Wendell Green, Toledo; Dr. Robert E. Tschantz, Canton; Dr. Robert M. Inglis, Columbus; and Dr. William D. Monger, Lancaster (reelected).

TEXAS

Foundation for Research in Psychiatry.—Plans for newly formed Timberlawn Foundation for Education and Research in Psychiatry were set up by the board of trustees at their regular meeting in Dallas. These include proposed invitations to leading psychiatrists and scientists to teach and do research at Timberlawn and give public lectures. Besides the stepped-up training of residents in psychiatry, of externs and interns, of therapists and nurses at Timberlawn, several areas of research already underway will be continued, including a review of 12,000 cases of mental illness treated at Timberlawn since 1917, clinical research on schizophrenic ability to handle abstract concepts, research on an attempt to predict the therapeutic results in schizophrenics, and research on the husbands of schizophrenic wives. Psychiatric counseling of business executives and religious leaders will be expanded. Long-range plans include an endowment fund of $1,500,000, three buildings to allow expansion of research and education program, and a memorial lectureship under which "eminent psychiatrists" will be invited to work with the foundation for a full year. Timberlawn Foundation is a nonprofit organization formed last year by a group of Dallas business and professional men to carry on and expand the research and education program which has been carried on at Timberlawn Sanitarium for many years. Specific aims of the foundation are to promote psychiatry and its related sciences, to give scientists an opportunity to do research, and to train physicians, nurses, and therapists in mental illness.

WYOMING

Annual Meeting in Moran.—The 56th annual meeting of the Wyoming State Medical Association will be held at Jackson Lake Lodge, Moran, June 11-13, under the presidency of Dr. L. Harmon Wilmoth, Lander. The House of Delegates will convene the morning of June 12. Two movies are scheduled, "Open-Heart Surgery Using the Kay–Anderson Heart–Lung Machine," by Dr. Jerome H. Kay, Beverly Hills, Calif., and "Cold Coning of the Uterine Cervix," by Dr. Harry W. Seiger, Santa Monica, Calif. Participants include the following: Drs. Ralph C. Benson, Portland, Ore.; Ralph M. Stuck, Denver; Edward H. Rynearson, Rochester, Minn.; H. Mason Morfit, Denver; John M. Salyer, Denver; Charles H. Scheifley, Rochester, Minn.; Alan R. Mortiz, Cleveland; and Edgar J. Poth, Galveston, Texas. Registration fee is $25, with medical students admitted free. For information, write Mr. Arthur R. Abbey, Box 2036, Cheyenne, Wyo., Executive Secretary.

GENERAL

National Recreation Month.—The National Recreation Association announced that June has been proclaimed National Recreation Month with the theme "Find New Worlds Through Recreation." The four weeks of the month, "designed to show the value and scope of leisure time activities," are Youth Fitness Week, Family Recreation Week, Arts and Recreation Week, and Service-Through-Recreation Week. Recreation Month materials are available from the National Recreation Association by writing the Public Information and Education Department, 8 W. Eighth St., New York 11.

Gastroenterology Meeting in Atlantic City.—The eighth meeting of the Gastroenterology Research Group will be held in Trimble Hall, Claridge Hotel, Atlantic City, the afternoon of June 4. The meeting will be a symposium on "Fine Structure as Related to Absorption, Synthesis and Transport in the Gastrointestinal Tract." The program has been arranged by Dr. Wade Volwiler, Seattle and Dr. Albert I. Mendeloff, Baltimore, and will be moderated by Dr. H. Stanley Bennett, Seattle. An informal dinner will follow the afternoon meeting. The group, in cooperation with the American Gastroenterological Association, will sponsor a morning program, the Gastroenterological Research Forum, which will consist of a series of 10-minute papers.

Meeting on Diabetes.—The 19th annual meeting of the American Diabetes Association will be held June 6-7 at the Chalfonte–Haddon Hall, Atlantic City, N. J., under the presidency of Dr. Alexander Marble, Boston. A total of 24 papers are scheduled for presentation in addition to 16 papers to be read by title. At the banquet June 6, 7:30 p. m., following an address by Dr. Marble, awards will be presented as follows: the Lilly Award to Dr. Marvin D. Siperstein, Dallas; a Banting Medal to Dr. George W. Thorn, Boston; a Banting Medal to Dr. E. T. Bell, Minneapolis. Dr. Boland Hughes, Philadelphia, will present "The Contemporary Scene in the U. S. S. R." at the banquet. A panel discussion on "Oral Hypoglycemic Agents" will be moderated by Dr. Garfield G. Duncan, Philadelphia, on the afternoon of June 7.

Geriatric Meeting in Atlantic City.—The 16th annual meeting of the American Geriatrics Society will be held June 4-5 at the Hotel Traymore, Atlantic City, N. J., under the presidency of Dr. Warren H. Cole, Chicago. Ten papers are scheduled for presentation, and the following panel discussions and moderators are planned:

Problems of the Aged in Industry, Dr. George C. Dowd, Worcester, Mass.
Concepts of the Medical Profession in Relation to Aging, Dr. Joseph D. McCarthy, Omaha.
Surgery in the Aged, Dr. Frank Glenn, New York City.
Advances in the Diagnosis and Treatment of Cerebrovascular Disease, Dr. Irving S. Wright, New York City.

The annual reception and dinner will be held June 4, 6:30 p. m. For information, write Dr. Richard J. Kraemer, 2907 Post Rd., Warwick, R. I., Secretary-Treasurer.

Meeting of Gastroscopic Society.—The 18th annual meeting of the American Gastroscopic Society will be held June 7 in Haddon Hall, Atlantic City, N. J. The program includes the following symposiums and moderators:

Gastroscopic Color Photography, Dr. Frank B. McGlone, Denver.
Endoscopic Biopsy of the Stomach, Dr. C. Wilmer Wirts, Philadelphia.
Instruments and Techniques for Esophagoscopy, Dr. Herman J. Moersch, Rochester, Minn.

The annual banquet at 7:30 p. m. will conclude the meeting, with Capt. Finn Ronne presenting "Exploring Antarctica." Dr. J. Edward Berk, Detroit, president of the society, will preside at the banquet. For information, write Dr. Arthur M. Olsen, 200 First St., S. W., Rochester, Minnesota, Secretary-Treasurer.

Italian Psychiatrist Receives Travel Award.—In ceremonies held during the annual convention of the American Psychiatric Association meeting, Dr. Ugo Cerletti, professor of neuropathology and psychiatry, University of Rome, was made a Laureate of the Purdue Frederick Medical Achievement Travel Award. Dr. Cerletti was cited for his "long and outstanding record of important research contributions in the science of psychiatry." The award winner is known for the introduction of electric con-

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vulsive treatment in psychiatric therapy. The Medical Achievement Travel Award is sponsored by The Purdue Frederick Company of New York and is administered by the International Council for Health and Travel. The award enables recipients to attend and participate in medical and scientific meetings here and abroad to "further the international exchange of scientific and medical research on a physician-to-physician basis."

Society News.—The **American Academy for Cerebral Palsy** officers for this year are as follows: Drs. Alvin J. Ingram, Memphis, Tenn., president; Raymond R. Rembolt, Iowa City, president-elect; Temple S. Fay, Philadelphia, vice-president; Glidden L. Brooks, Providence, R. I., secretary; and Samuel B. Thompson, Little Rock, Ark., treasurer. The 1959 annual meeting will be held in Los Angeles Nov. 30-Dec. 2 at the Hotel Statler.——At the 12th annual meeting of the **Neurosurgical Society of America,** the following officers were elected: president, Dr. Collin S. MacCarty, Rochester, Minn.; vice-presidents, Drs. Edward B. Schlesinger, New York City, and Thomas J. Holbrook, Huntington, W. Va.; secretary, Dr. Raymond K. Thompson, Baltimore; and treasurer, Dr. Bertram Selverstone, Boston. The next meeting of the society will be held at Del Monte Lodge, Calif., March 30-April 2, 1960.——As of April 24, the new address of the **American Foundation for Tropical Medicine, Inc.,** will be Room 715, 551 Fifth Ave., New York 17; Telephone: MUrray Hill 7-7290.

Conference on Angiology.—As part of the 10th anniversary observance of the founding of the Angiology Research Foundation, a World Conference of Angiology will be held in Atlantic City, N. J., June 5-7, in connection with the fifth annual meeting of the American College of Angiology. Dr. David B. Allman, past-president, American Medical Association, and Brig. Gen. Thomas W. Mattingly, director of medical education, Washington Hospital Center, Washington, D. C., are the honorary co-chairmen of the conference. The co-chairmen are Alfred Halpern, Ph.D., president, Angiology Research Foundation, Dr. Paul S. Lowenstein, president, American College of Angiology, and Dr. Saul S. Samuels, editor-in-chief of *Angiology*. Forty-one scientific papers are to be presented by a total of 37 researchers from 10 different countries, including Argentina, Canada, six countries of Europe, and many parts of the United States. Dr. Charles W. Mayo, head of a section on surgery, Mayo Clinic, Rochester, Minn., and chief United States delegate to the World Health Assembly of the United Nations, will be the principal speaker at a reception and banquet Saturday, June 6. The World Conference of Angiology, sponsored by the Angiology Research Foundation, the American College of Angiology and by *Angiology*, is being supported by educational grants from Mead Johnson & Company and the Ortho Research Foundation. All sessions are to be held at the Marlborough-Blenheim Hotel and will be open to all members of the medical profession.

Prevalence of Poliomyelitis.—According to the National Office of Vital Statistics, the following number of reported cases of poliomyelitis occurred in the United States, its territories and possessions in the weeks ended as indicated:

Area	May 2, 1959 Paralytic Type	May 2, 1959 Total Cases	May 3 1958 Total
New England States			
Maine	..	..	..
New Hampshire	..	..	..
Vermont	..	..	..
Massachusetts	..	..	..
Rhode Island	..	..	..
Connecticut	..	..	..
Middle Atlantic States			
New York	..	..	1
New Jersey	..	..	..
Pennsylvania	..	..	..
East North Central States			
Ohio	..	1	1
Indiana	..	..	..
Illinois	..	1	..
Michigan	..	1	..
Wisconsin	..	..	1
West North Central States			
Minnesota	..	..	..
Iowa	..	..	2
Missouri	2	2	..
North Dakota	..	..	1
South Dakota	..	..	..
Nebraska	..	..	..
Kansas	..	..	..
South Atlantic States			
Delaware	..	..	..
Maryland	..	..	..
District of Columbia	..	..	..
Virginia	2	2	..
West Virginia	..	1	1
North Carolina	1	1	..
South Carolina	..	..	..
Georgia	..	..	..
Florida	5	6	2
East South Central States			
Kentucky	..	..	1
Tennessee	1	1	..
Alabama	..	..	..
Mississippi	..	..	..
West South Central States			
Arkansas	1	1	..
Louisiana	1	1	..
Oklahoma	..	..	1
Texas	1	3	6
Mountain States			
Montana	..	..	..
Idaho	..	..	..
Wyoming	..	..	..
Colorado	..	..	..
New Mexico	..	1	..
Arizona	..	..	..
Utah	..	..	..
Nevada	..	..	..
Pacific States			
Washington	..	1	..
Oregon	2	2	..
California	4	4	1
Alaska	..	..	..
Hawaii	..	..	..
Puerto Rico	..	..	1
Total	20	29	19

CANADA

Summer School Guest Speakers.—The Vancouver Medical Association Summer School to be conducted June 1-5 at the Stanley Park Pavilion, Vancouver, B. C., will have the following guest speakers:

Dr. Lennox G. Bell, dean, Faculty of Medicine, University of Manitoba; Prof. Hugh McLaren, department of obstetrics and gynaecology, Queen Elizabeth Hospital, Birming-

ham, England; Dr. George T. Pack, associate professor of clinical surgery, Cornell University School of Medicine, New York City; Dr. Donald R. Smith, clinical professor of urology, University of California School of Medicine, Berkeley-San Francisco; and Dr. Theodore E. Walsh, professor of otolaryngology, Washington University, St. Louis.

CORRECTION

Hyperthyroidism in Infants at Birth.—In the initial answer to the Question and Answer with this title (Feb. 7, page 656) the consultant prepared a section on the mercaptoimidazoles as well as a separate section on the iodinated goitrogens such as iothiouracil sodium. Because of the limitation of space, our consultant was asked to shorten his answer. In the shortening procedure, the drug referring to the first group was left in as an example of the second.

EXAMINATIONS AND LICENSURE

NATIONAL BOARD OF MEDICAL EXAMINERS

National Board of Medical Examiners: Various Centers: Parts I and II, June 16-17; Part I only, Sept. 9-10. Examinations must be received at least six weeks in advance of a specific examination date. Examining centers established after close of registration. Exec. Sec., Dr. John P. Hubbard, 133 South 36th St., Philadelphia 4.

EDUCATIONAL COUNCIL FOR FOREIGN MEDICAL GRADUATES, INC.

Educational Council for Foreign Medical Graduates: Stations around the world, Sept. 22. Final date for filing applications is June 22. Exec. Director, Dr. Dean F. Smiley, 1710 Orrington Ave., Evanston, Ill.

BOARDS OF MEDICAL EXAMINERS

ALABAMA: *Written.* Montgomery, June 16-18. Sec., Dr. D. G. Gill, State Office Bldg., Montgomery 4.

ALASKA:* On application in Anchorage or Fairbanks. Sec., Dr. W. M. Whitehead, 172 South Franklin St., Juneau.

ARIZONA:* *Reciprocity.* Phoenix, July 15-17. Exec. Sec., Mr. Robert Carpenter, 826 Security Bldg., Phoenix.

ARKANSAS:* *Examination and Reciprocity.* Little Rock, June 11-12. Sec., Dr. Joe Verser, Harrisburg.

CALIFORNIA: *Written.* San Francisco, June 15-18; Los Angeles, Aug. 17-20; Sacramento, October 19-22. *Oral.* San Francisco, June 13; Los Angeles, August 15; San Francisco, November 14. *Oral and Clinical.* San Francisco, June 14; Los Angeles, August 16; San Francisco, Nov. 15. Sec., Dr. Louis E. Jones, Room 536, 1020 N Street, Sacramento.

COLORADO:* *Examination.* Denver, June 9-10. *Reciprocity.* Denver, July 14. Sec., Dr. John B. Farley, 712 Republic Bldg., Denver 2.

CONNECTICUT:* *Homeopathic Board. Reciprocity.* Derby, June 9. Sec., Dr. Donald A. Davis, 38 Elizabeth St., Derby. *Regular Board. Examination.* Hartford, July 14-16. Sec., Dr. Staley B. Weld, 160 St. Ronan St., New Haven.

DELAWARE: *Examination.* Dover, July 14-16. *Endorsement.* Dover, July 23. Sec., Dr. Joseph S. McDaniel, Professional Bldg., Dover.

DISTRICT OF COLUMBIA:* *Written.* Washington, June 8-9. Final date for filing application is May 1. Mr. Paul Foley, Deputy Director, 1740 Massachusetts Ave., N. W., Washington.

FLORIDA:* *Examination.* Miami Beach, June 21-23. Sec., Dr. Homer L. Pearson, 901 N.W. 17th St., Miami 36.

GEORGIA: *Examination and Reciprocity.* Atlanta, June 10-11. Sec., Mr. C. L. Clifton, 224 State Capitol, Atlanta 3.

GUAM: *Subject to Call.* Act. Sec., Dr. F. L. Conklin, Agana.

HAWAII: *Written.* Honolulu, July 13-14. Sec., Dr. I. L. Tilden, 1020 Kapiolani St., Honolulu.

IDAHO: *Examination and Endorsement.* Boise, July 13. Exec. Sec., Mr. Armand L. Bird, 364 Sonna Bldg., Boise.

ILLINOIS: *Examination.* Chicago, July 7-10. *Reciprocity.* Chicago, July 10. Supt. of Registration, Mr. Frederic B. Selcke, Capitol Building, Springfield.

INDIANA: *Examination.* Indianapolis, June 17-19. Exec. Sec., Miss Ruth V. Kirk, 538 K. of P. Bldg., Indianapolis.

IOWA:* *Examination.* Iowa City, June 15-17. Exec. Sec., Mr. Ronald V. Saf, State Office Bldg., Des Moines 19.

KANSAS:* *Examination and Endorsement.* Kansas City, June. Sec., Dr. F. J. Nash, New Brotherhood Bldg., Kansas City.

KENTUCKY: *Examination.* Louisville, June 8-10. Sec., Dr. Russell E. Teague, 620 South Third St., Louisville 2.

LOUISIANA: *Examination. and Reciprocity.* New Orleans, June 4-6. Sec., Dr. Edwin H. Lawson, 930 Hibernia Bank Bldg., New Orleans.

MAINE: *Examination and Reciprocity.* Augusta, July 14-16. Sec., Dr. Stephen A. Cobb, Sanford.

MARYLAND: *Examination.* Baltimore, June 10-13. Sec., Dr. Frank K. Morris, 1211 Cathedral St., Baltimore 1.

MICHIGAN:* *Examination.* Ann Arbor and Detroit, June 8-10. Sec., Dr. E. C. Swanson, 118 Stevens T. Mason Bldg., West Michigan Ave., Lansing 8.

MISSISSIPPI: *Examination and Reciprocity.* Jackson, June 22-24. Sec., Dr. A. L. Gray, Old Capitol, Jackson 13.

MISSOURI: *Examination.* St. Louis, May 29-30. Exec. Sec., Mr. John A. Hailey, Box 4, State Capitol Bldg., Jefferson City.

MONTANA: *Examination and Reciprocity.* Helena, Oct. 6. Sec., Dr. Thomas L. Hawkins, 555 Fuller Ave., Helena.

NEBRASKA:* *Examination.* Omaha, June 15-17. Director, Mr. Husted K. Watson, Room 1009, State Capitol Bldg., Lincoln 9.

NEVADA: *Examination and Reciprocity.* Reno, June 2. Sec., Dr. George H. Ross, 112 North Curry St., Carson City.

NEW HAMPSHIRE: *Examination and Reciprocity.* Concord, Sept. 9-12. Sec., Dr. Edward W. Colby, 107 State House, Concord.

NEW JERSEY: *Examination.* Trenton, June 16-18. Sec., Dr. Royal A. Schaaf, 28 West State St., Trenton 8.

NEW YORK: *Examination.* New York, Rochester, Syracuse, Buffalo and Albany, June 23-26. Sec., Dr. Stiles D. Ezell, 23 S. Pearl St., Albany.

NORTH CAROLINA: *Written. Examination and Endorsement.* Raleigh, June 15-18. Sec., Dr. Joseph J. Combs, 716 Professional Bldg., Raleigh.

NORTH DAKOTA: *Examination and Reciprocity.* Grand Forks, July 8-11. Sec., Dr. C. J. Glaspel, Box 228, Grafton.

OHIO: *Examination.* Columbus, June 18-20. Sec., Dr. H. M. Platter, 21 West Broad St., Columbus 15.

OKLAHOMA:* *Examination.* Oklahoma City, June 2-3. Exec. Sec., Mrs. E. L. Haidek, 813 Braniff Bldg., Oklahoma City.

OREGON:* *Examination.* Portland, July 7-9. *Reciprocity and Endorsement.* Portland, July 9-11. Exec. Sec., Mr. Howard I. Bobbitt, 609 Failing Bldg., Portland.

PENNSYLVANIA: *Examination and Endorsement.* Philadelphia and Pittsburgh, July 1-3. Sec., Mrs. Margaret G. Steiner, Box 911 Harrisburg.

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GOVERNMENT SERVICES

NAVY

Personal.—Capt. Lynn S. Beals Jr., M. C., United States Navy, was placed on the retired list on April 1, after completing more than 20 years of active naval service.——Rear Adm. Irwin L. V. Norman, M. C., U. S. Navy, was placed on the retired list of officers of the U. S. Navy on May 1. He had served in the Bureau of Medicine and Surgery, Navy Department, since February, 1955; he has been Assistant Chief of the Bureau for Personnel and Professional Operations and Inspector General of Medical Department Activities, taking over the latter duties in March, 1958. On retiring he had more than 31 years of active naval service.

VETERANS ADMINISTRATION

Research in Aging.—A forward look at medical research of the future to prolong health and happiness for the aging population is available in a booklet entitled "VA Prospectus, Research in Aging," a compilation of material from a meeting of the VA Advisory Committee on Problems of Aging, distinguished guests, and VA Department of Medicine and Surgery staff members. The book is divided into five presentations, each followed by discussion: (1) Aging of Molecules—Aging and Ground Substance of Connective Tissue, by Isidore Gersh, Ph.D., Department of Anatomy, University of Chicago School of Medicine, (2) Aging of Cells, by Robert J. Boucek, M.D., Department of Cardiovascular Disease, University of Miami School of Medicine, (3) Aging of Organs—Aging and the Nervous System, by James E. Birren, M.D., chief of the Section on Aging of the National Institute of Mental Health, (4) Aging of Individuals—Some Fundamental Aspects of the Aging Process, by Charles F. Geschickter, M.D., Department of Pathology, Georgetown University School of Medicine, and (5) Aging of Groups, by Jack Weinberg, M.D., attending psychiatrist at Michael Reese Hospital, Chicago. A summary of the conference, by Wilburt C. Davison, M.D., dean of the Duke University School of Medicine, is also included.

Athol Gordon, M.D., William S. Middleton, M.D., John B. Barnwell, M.D., Martin M. Cummings, M.D., Charles C. Chapple, M.D., Joseph Bernsohn, Ph.D., Lee D. Cady, M.D., Neal W. Coppinger, Ph.D., Charles E. Hogancamp, M.D., Kung-Ying Tang Kao, M.D., Ph.D., Thomas H. McGavack, M.D., Stewart G. Tuttle, M.D., John A. Ward, M.D., and others also participated. Dr. Charles C. Chapple is the editor. Copies are available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a price of $1.50 each.

PUBLIC HEALTH SERVICE

Air Pollution.—The complete proceedings of the National Conference on Air Pollution which was held in Washington in November have been published in book form. The 528-page volume includes the full texts of all the talks plus reports of discussions. The report covers the entire air pollution field—extent, sources, health effects, economic and social effects, control methods, and administrative aspects. It is identified as Public Health Service Publication 654 and is available at $1.75 from the Superintendent of Public Documents, U. S. Government Printing Office, Washington 25, D. C.

FOOD AND DRUG ADMINISTRATION

Color Used in Lipstick.—Seventeen coal-tar colors would be removed from the approved list for unrestricted use in drugs and cosmetics under a proposed order because they cannot be certified as harmless for use in products which in normal use may enter the digestive system. Under the proposed action, these colors could not be used in lipsticks, and the variety of shades now available would be decreased appreciably until cosmetic manufacturers find new ways of reproducing these shades. Seven of these 17 colors caused definite injury to laboratory animals when fed in amounts making up 0.25 to 2.0% of the diet. The other 10 are closely related in their chemical structure to these seven.

There have as yet been no reports of injury to users of lipstick, drugs, or foods made with these coal-tar derivatives. Although the amounts of these colors that get into the digestive system are smaller than those used in Food and Drug Administration (FDA) tests, under the law as interpreted by the Supreme Court the FDA cannot set the amounts of coal-tar colors to be used in foods, drugs, and cosmetics and, accordingly, cannot certify to the safety of colors for unrestricted use unless they are completely harmless. The FDA will not only stop certifying new batches for internal use, but will also stop the use of any stock outstanding. Interested persons are allowed 30 days after publication of these proposals in the federal register to make written comments. These comments will be taken into account by the commissioner of food and drugs in the drafting of an order.

DEATHS

Areson, William Henry Ⓜ De Soto City, Fla.; Columbia University College of Physicians and Surgeons, New York City, 1896; veteran of World War I; fellow of the American College of Surgeons; formerly practiced in Upper Montclair, N. J., and served as president of the Essex County Medical Society; for many years director of board of health of Montclair, N. J., where he was president of the staff of the Mountainside Hospital; died in Arcadia March 7, aged 84.

Arrasmith, Thomas Milton Jr. Ⓜ Richmond, Va.; Jefferson Medical College of Philadelphia, 1924; retired from the regular U. S. Navy on June 30, 1956; veteran of World War II; chief of the bureau of medical aid of the city department of public health; died in St. Luke's Hospital March 5, aged 59.

Barksdale, George Edward Ⓜ Fletcher, N. C.; University College of Medicine, Richmond, 1899; veteran of World War I; died March 6, aged 89.

Becker, Israel Ⓜ Chicago; Dalhousie University Faculty of Medicine, Montreal, Que., Canada, 1927; served on the faculty of the Chicago Medical School; on the staffs of the Franklin Boulevard Hospital, Mount Sinai Hospital, and the Louis A. Weiss Memorial Hospital, where he died March 10, aged 59.

Blackford, Harry Ⓜ Seattle; University of Oregon Medical School, Portland, 1914; veteran of World War I; died in the Swedish Hospital Feb. 23, aged 74.

Boor, Seymour Carl, Creston, Ohio; University of Wooster Medical Department, Cleveland, 1898; served on the staff of the Wooster (Ohio) Community Hospital; died Feb. 16, aged 90.

Cook, Robert Milton, Boones Mill, Va.; Medical College of Virginia, Richmond, 1954; on the staff of the Franklin Memorial Hospital in Rockymount; died in Roanoke Feb. 27, aged 32.

Couche, James Buxton, San Diego, Calif.; University of Toronto Faculty of Medicine, Toronto, Ontario, Canada, 1899; veteran of World War I; died in the Scripps Metabolic Clinic in La Jolla Feb. 16, aged 88.

Cummings, Damon Ward Ⓜ Kansas City, Mo.; University of Louisville (Ky.) School of Medicine, 1928; veteran of World War II; on the staff of the Veterans Administration Hospital; died Feb. 28, aged 59.

Ⓜ Indicates Member of the American Medical Association.

Drake, Arthur Knowlton Ⓜ Toulon, Ill.; Harvard Medical School, Boston, 1898; served as superintendent of the Elmgrove Sanatorium in Bushnell; at one time associated with the State Infirmary in Tewksbury, Mass.; died in the Methodist Hospital in Peoria, Feb. 20, aged 86.

Edison, Earl Maynard Ⓜ San Marino, Calif.; Northwestern University Medical School, Chicago, 1937; member of the American Academy of General Practice; veteran of World War II; died Feb. 20, aged 49.

Eells, Joseph Oliver, West Palm Beach, Fla.; Tufts College Medical School, Boston, 1901; died Feb. 25, aged 82.

Ellerbrook, George Edward, Vevay, Ind.; University of Louisville (Ky.) School of Medicine, 1932; coroner of Switzerland County; on the staff of the King's Daughters' Hospital in Madison; died Feb. 25, aged 51.

Ellyson, Charles Wright Ⓜ Waterloo, Iowa; State University of Iowa College of Medicine, Iowa City, 1905; fellow of the American College of Surgeons and the International College of Surgeons; served as president of the Waterloo Medical Society; treasurer of the Black Hawk County Medical Society from 1920 to 1929; for 10 years councilor of the Sixth District of the Iowa State Medical Society; associated with the Allen Memorial, Schoitz Memorial, and St. Francis hospitals; died March 1, aged 81, of coronary occlusion.

Fatherree, John Pleasant Ⓜ Laurel, Miss.; Tulane University School of Medicine, New Orleans, 1939; member of the Southeastern Surgical Congress; fellow of the International College of Surgeons and the American College of Surgeons; medical director and superintendent of the South Mississippi Charity Hospital; on the staff of the Jones County Community Hospital; died Feb. 22, aged 51.

Finch, Frederic Arlington, Amagansett, N. Y.; Baltimore University School of Medicine, 1899; retired coroner of Suffolk County; on the staff of the Southampton (N. Y.) Hospital; died Feb. 12, aged 82.

Fredrickson, Gereon Ⓜ Iron Mountain, Mich.; Chicago College of Medicine and Surgery, 1917; veteran of World War I; served as mayor of Iron Mountain; member of the board of education; physician for Iron Mountain schools and served as director of the Dickinson County Health Department; died in the Veterans Administration Hospital Feb. 22, aged 64.

Goldstein, Leon Aaron ⊗ Syracuse, N. Y.; Syracuse University College of Medicine, 1928; member of the American Academy of General Practice; veteran of World War II; on the staff of the Crouse–Irving Hospital; died in St. Petersburg, Fla., Feb. 18, aged 55.

Gormley, John Harry ⊗ Winnetka, Ill.; Northwestern University Medical School, Chicago, 1927; died March 12, aged 58.

Gould, George Richard ⊗ Conrad, Iowa; State University of Iowa College of Medicine, Iowa City, 1916; past-member of the school board; veteran of World War I; for eight years member of the hospital board, Grundy County Memorial Hospital in Grundy Center, where he died Feb. 18, aged 72.

Havens, Frederick Morgan ⊗ Niagara Falls, N. Y.; University of Buffalo School of Medicine, 1933; member of the American Society of Anesthesiologists; served a residency in anesthesia at Bellevue Hospital in New York City; veteran of World War II; on the staffs of the Memorial and St. Mary's hospitals; died Feb. 27, aged 49.

Hennings, Albert Ernest ⊗ Tuttle, Okla.; St. Louis College of Physicians and Surgeons, 1907; died in the Wesley Hospital, Oklahoma City, Feb. 28, aged 80.

Horkins, Harold Albert ⊗ Detroit; University of Toronto Faculty of Medicine, Toronto, Ont., Canada, 1928; certified by the National Board of Medical Examiners; associated with St. Mary's and Holy Cross hospitals; died Jan. 11, aged 56.

Jeans, Howard Stafford ⊗ Lynwood, Calif.; George Washington University School of Medicine, Washington, D. C., 1943; member of the American Academy of General Practice; veteran of World War II; on the staff of St. Francis Hospital, where he died Feb. 25, aged 41.

Johnston, Crowell William ⊗ West Palm Beach, Fla.; University of Georgia Medical Department, Augusta, 1899; died Feb. 24, aged 83.

Keating, Peter McCall, Philadelphia; born in Atlantic City, N. J., July 21, 1884; University of Pennsylvania Department of Medicine, Philadelphia, 1910; served on the faculty of his alma mater; specialist certified by the American Board of Orthopaedic Surgery; served as an observer in the U. S. Army attached to the French Army in 1915-1916 and was decorated by the French government; veteran of World Wars I and II; fellow of the American Academy of Orthopaedic Surgery, Philadelphia Surgical Society, and the Texas Surgical Society; member and past-president of the Texas Orthopaedic Association, of which he was founder; associated with the Bryn Mawr (Pa.) Hospital, Pennsylvania Hospital, and the Misericordia Hospital; served on the staffs of the Robert B. Green, Santa Rosa, and Nix Memorial hospitals in San Antonio, Texas; formerly medical director of the Gonzales Warm Springs Foundation Hospital for Crippled Children in Gonzales, Texas; died in the Hospital of the University of Pennsylvania Feb. 20, aged 74.

Kretsch, Russell Woodling ⊗ Hammond, Ind.; Indiana University School of Medicine, Indianapolis, 1925; veteran of World War I; member of the staff of St. Margaret Hospital; died Feb. 23, aged 61.

LaForge, Alvin Wilfred, Austin, Texas; the Hahnemann Medical College and Hospital, Chicago, 1911; veteran of World War I; died Feb. 21, aged 70.

Leasum, Robert Nels ⊗ Osseo, Wis.; Jefferson Medical College of Philadelphia, 1918; veteran of World War I; on the staffs of the Sacred Heart Hospital and Luther Hospital in Eau Claire, where he died Feb. 27, aged 67.

Leyda, Paul Leighton Jr., Denver; University of Colorado School of Medicine, Denver, 1946; interned at Highland–Alameda County Hospital in Oakland, Calif.; served a residency at the St. Francis Hospital and Sanatorium in Colorado Springs, Colo., and the Veterans Administration Hospital in Denver; specialist certified by the American Board of Surgery; member of the Industrial Medical Association; captain, medical corps, U. S. Army Reserve from 1947 to 1949; formerly associated with the Lanai Community Hospital in Lanai City, Hawaii; died Feb. 24, aged 36.

Manahan, Charles Albert, Vinton, Iowa; State University of Iowa College of Homeopathic Medicine, Iowa City, 1908; Jefferson Medical College of Philadelphia, 1909; veteran of World War I; on the staff of the Virginia Gay Hospital; died Feb. 25, aged 73.

Markoff, Samuel Tobias ⊗ Brooklyn; Yale University School of Medicine, New Haven, Conn., 1926; member of the American Academy of General Practice; on the staff of the Brooklyn Women's Hospital; died March 6, aged 56.

Matthews, Augustus Douglas ⊗ Ozark, Ala.; University of Alabama School of Medicine, Mobile, 1911; served as a member and chairman of the Dale County Board of Education; died Feb. 20, aged 72.

McConnell, Joseph Horton ⊗ Galveston, Texas; University of Texas School of Medicine, Galveston, 1956; also held a degree in law; veteran of World War II and the Korean War; retired captain in the Air Force; died Feb. 24, aged 37.

McCrary, Dowell Womack, Stevenson, Ala.; Memphis (Tenn.) Hospital Medical College, 1913; died in the Jackson County Hospital, Scottsboro, Feb. 23, aged 73.

Natt, Jerome ⊗ Roanoke, Va.; Long Island College of Medicine, Brooklyn, 1933; member of the American Academy of General Practice; past-president of the Roanoke Council for Retarded Children; died Feb. 22, aged 51.

Nutter, Edwin Hughes ⊗ Newark, Del.; Hahnemann Medical College and Hospital of Philadelphia, 1935; interned at Homeopathic Hospital in Wilmington; member of the American Academy of General Practice; associated with the Memorial Hospital in Wilmington, where he died Feb. 24, aged 51.

O'Donnell, Reynolds Joseph ⊗ Santa Monica, Calif.; Creighton University School of Medicine, Omaha, 1929; served on the faculty of his alma mater; veteran of World War II; vice-chief of staff, secretary and treasurer of the St. John's Hospital; member of the staff of Santa Monica Hospital; past-president of the Catholic Physicians' Guild of Greater Los Angeles and a past-president of the Creighton University Alumni Association of Southern California; died Dec. 11, aged 57.

Parker, Oliver T. ⊗ Salida, Colo.; University Medical College of Kansas City, Mo., 1897; served on the staff of the Denver and Rio Grande Western Hospital; died Feb. 22, aged 82.

Paulson, Alvin Winfred ⊗ Oklahoma City, Okla.; Washington University School of Medicine, St. Louis, 1932; veteran of World War II; associated with the University and Children's hospitals, and head of the outpatient department of Veterans Administration Hospital, where he died March 7, aged 51.

Peck, Anna Dixon, Oakland, Calif.; Cooper Medical College, San Francisco, 1900; served as superintendent of schools in Napa County; for many years associated with the U. S. Veterans Bureau in Washington, D. C.; died Feb. 26, aged 90.

Peck, Willena Abby ⊗ Stow, Mass.; Woman's Medical College of Baltimore, 1900; at one time associated with the Blue Mountain (Miss.) College and the Alabama College in Montevallo, where she received an honorary doctor of laws degree; died in the Emerson Hospital, Concord, Feb. 27, aged 84.

Rininger, Harold Casper ⊗ Evansville, Ind.; Indiana University School of Medicine, Indianapolis, 1930; veteran of World War II; on the staffs of the St. Mary's and the Welborn Memorial Baptist hospitals; died in the Barnes Hospital, St. Louis, Feb. 28, aged 52.

Riter, James Foster, Bryson City, N. C.; Jefferson Medical College of Philadelphia, 1904; veteran of the Spanish–American War; died Feb. 19, aged 80.

Roark, Walter William ⊗ Bethpage, Tenn.; University of Tennessee College of Medicine, Memphis, 1912; died Feb. 19, aged 86.

Rogers, William Hershel, Blairsville, Ga.; Medico-Chirurgical College of Philadelphia, 1901; died Feb. 23, aged 88.

Rowat, Harry Lewis ⊗ Des Moines, Iowa; State University of Iowa College of Homeopathic Medicine, Iowa City, 1904; died Feb. 17, aged 80.

Schenck, Sam Moore ⊗ Shelby, N. C.; University of Pennsylvania School of Medicine, Philadelphia, 1923; fellow of the American College of Surgeons; on the staff of the Cleveland County Hospitals; died in Manteo, N. C., Feb. 10, aged 63.

Scott, Ira Benjamin, Cleveland; Meharry Medical College, Nashville, Tenn., 1923; died in the Polyclinic Hospital Feb. 4, aged 69.

Stott, Ardenne Albert ⊗ Bath, Maine; Tufts College Medical School, Boston, 1907; fellow of the American College of Surgeons; veteran of World Wars I and II; member of the staff of the Bath Memorial Hospital; died in the Maine Medical Center, Portland, Feb. 9, aged 75.

Straeten, Renier John ⊗ Commander, U. S. Navy, retired, Los Angeles; John A. Creighton Medical College, Omaha, 1905; entered the U. S. Navy in 1907 and retired June 30, 1936; died Dec. 19, aged 74.

Taitz, Irvin Solomon ⊗ Pittsburgh; Universität Basel Medizinische Fakultät, Switzerland, 1937; served on the staff of the Columbia Hospital in Wilkinsburg, Pa.; died in the Montefiore Hospital March 4, aged 48.

Vandever, Harl Fitzgerrell ⊗ Enid, Okla.; University Medical College of Kansas City, Mo., 1907; veteran of World War I; medical director of the Enid State School; associated with the Enid General Hospital, where he died March 7, aged 74.

Wilson, Morris Wulfson ⊗ Oak Park, Mich.; Universität Basel Medizinische Fakultät, Switzerland, 1936; served a residency in pathology at the Children's Hospital in Washington, D. C., and the Colorado State Hospital in Pueblo; specialist certified by the American Board of Pathology; member of the College of American Pathologists and the American Society of Clinical Pathologists; association with the U. S. Public Health Service terminated Sept. 29, 1946; served on the staff of the Veterans Administration Center at Mountain Home, Tenn.; died Jan. 16, aged 46.

Wolf, Morris ⊗ Brooklyn; Long Island College Hospital, Brooklyn, 1921; died in the Long Island College Hospital Dec. 29, aged 70.

Zarbaugh, Guy Frederic ⊗ Deadwood, S. D.; University of Nebraska College of Medicine, Omaha, 1925; veteran of World Wars I and II; died Feb. 27, aged 61.

FOREIGN LETTERS

GERMANY

Preventing Senility.—C. Hackmann (*München. med. Wchnschr.* 100:1814-1817, 1958) gave small doses of 2-(*p*-aminobenzenesulfonamide)-pyrimidine and 2-(*p*-aminobenzenesulfonamide)-methylpyrimidine to young rats. After several months he observed an improvement of the coat, increase in body weight, and a distinct improvement in the general condition, in contrast to control animals given tetracycline, chloramphenicol, and similar drugs. In all cases the treated animals lived longer than the controls. The author then repeated the experiment with old rats, and again he noticed a distinct improvement of the coat and general condition and a prolonged life, if the animals were treated for a sufficiently long time. The same results were obtained in mice. These effects were independent of the sex of the animal. The efficacy of the drugs was neutralized by simultaneously giving PABA.

In the same issue H. Hackmann and C. Hackmann reported the use of these drugs on 14 patients suffering from senile cataract. In 12 patients subjective and objective improvement of vision and in some striking improvement of the general condition were achieved. Side-effects or alteration of the blood chemistry did not occur.

INDIA

Long-Acting Sulfonamide.—K. J. Vyas treated 54 children suffering mostly from gastrointestinal and respiratory infections with sulfamethoxypyridazine. This compound is believed to be rapidly absorbed from the gastrointestinal tract, producing a high blood concentration within a short time which is maintained for a long time. Its degree of acetylation is low, solubility in urine low, and urinary excretion slow. Its antibacterial activity is equal to that of sulfadiazine. It was given in the form of a syrup in a single daily dose of 0.5 to 1.0 Gm. every morning. No other antibacterial agent was used. An alkaline mixture was given along with it, and the duration of treatment varied from 2 to 28 days, although it was given to most patients for less than a week.

In this series 44 patients were cured, 5 had marked relief, 2 had moderate relief, and 3 were not benefited; of these 2 had infectious diarrhea, and the 3rd had chronic otitis media with chronic upper respiratory tract infection. Side-effects were met with in only three and consisted of nausea and vomiting. Most patients responded well within five days of treatment. It was observed that in patients with bronchitis the cough was the last symptom to disappear, persisting long after the acute symptoms had disappeared. Chronic otitis media was slow to respond or did not respond at all, and in seven patients with respiratory infections the tonsils remained enlarged at the end of treatment. The drug was on the whole well tolerated and easily accepted by the children.

ITALY

Vitamin D_2.—L. Papadia of the Orthopedic Clinic of Florence (*Archivio Putti*, vol. 10, 1958) studied the action of large doses of chemically pure, orally administered vitamin D_2 on the muscles of growing rats in an effort to determine how much of the change described in the skeletal muscles after administration of large amounts of cod liver oil is due to its vitamin D_2 content and how much is due to a secondary action of the oil (caused by the ease with which it turns rancid), through destruction of the vitamin E content of the diet. The amount of vitamin D_2 administered was 2 mg. per day. The duration of treatment was two, four, six, or eight weeks. In all subjects changes in muscles were found, but while the animals treated for a shorter time showed reduction of the caliber of the fibers and a crowding together of the nuclei, those treated for a longer time showed more widespread degeneration. The changes observed were similar to those previously described after the use of cod liver oil. The author concluded that vitamin D_2 given in large amounts is capable by itself of producing marked alterations in muscles.

NORWAY

Mass Radiography.—Hansen and Riddervold (*Nord. med.* 61:169-174 [Jan. 29] 1959) stated that from 1943, when it was established, until the end of 1957 the mass-radiography service has made over 4,100,000 x-ray examinations of the population over 14 years of age. Each year radiograms of about 350,000 persons are taken by means of seven units, two of which are installed on boats. Since 1948 the mass radiography has been combined with tuberculin testing and BCG inoculation. The authorities concerned were empowered to summon people to

The items in these letters are contributed by regular correspondents in the various foreign countries.

these examinations. The films were read at a central office in Oslo with independent readings, since 1952, by two specialists and a control reading by a third who reexamined the films of those persons who by one or both of the first readers had been referred for follow-up examinations. Mass radiography was used most extensively in areas where there was a high incidence of tuberculosis. Of the 20 provinces in Norway 14 had been covered by mass radiography twice, 3 three times, and 1 five times. Attendance of the native population was between 72 and 84% for men and between 80 and 91% for women in the years 1949 to 1957.

In the years 1949 to 1953 between 2.8 and 4.2% of the persons examined were referred for follow-up examination. The follow-up study showed that 1.3 to 1.5 persons per 1,000 had tuberculosis, previously unrecognized in 0.07 to 0.12%. There was good correlation between the mortality from tuberculosis in each province and the incidence of new cases of active tuberculosis found. The number of infectious cases of tuberculosis was more than twice as high for men as for women in the older age groups. A corresponding difference was not found for other tuberculous changes in the lungs. Duplicate readings in 1953 of about 267,000 miniature films distributed among 29 readers showed a variation in the frequency of referrals of from 3.1 to 12.1%. The difference was essentially due to subjective factors. With unanimous reading by three specialists the incidence of infectious cases discovered by follow-up was 7.1%, with divergence among the readers of 0.8%.

SWEDEN

Convulsions in Childhood.—At the Kronprinsessan Lovisas Barnsjukhus children's hospital between 10 and 14% of the admissions from 1952 to 1956 were for convulsions. According to Dr. C. Gyllenswärd (*Svenska läkartidningen*, Feb. 6, 1959) they occur at least once in about 7% of all children under the age of 15 years. To distinguish among the 15 possible causes of a convulsion in childhood it is necessary to take the child to a hospital with a team specializing in neurology, psychiatry, radiology, surgery, physiology, and biochemistry. The author is opposed to the isolation of epileptic children in special classes. His hospital keeps in touch with some 500 children who have suffered from convulsions, and he believes that about 80% of such patients recover completely. With the drugs now available 90% of all epileptic children can be kept free of attacks, and of the remaining 10% most can achieve an appreciable reduction of their frequency. From both the medical and the scholastic points of view, most epileptic children should attend the same classes as normal children. To refer them to special schools or mix them with adult epileptics is cruel.

UNITED KINGDOM

Patent Medicines on Television.—The *British Medical Journal* of March 21 says in an annotation that anything that forces itself on the attention is apt to stir up mixed feelings. When advertisements fill the breaks between and within television programs, they find a captive audience that may be anything from inert to spellbound but is probably not highly critical. It is therefore reassuring to see that the opening words of the Independent Television Authority's principles of advertising state the general principle that it should be "legal, clean, and truthful." Clearly these are admirable precepts, and if they do not exclude the possibility of the advertisements also being nonsense, they are at least intended to prevent the use of half-truths.

In order to help the Authority maintain proper standards it has an advertisements committee, on which the BMA has an experienced representative in Dr. H. G. Dain. According to the assistant postmaster-general, who recently replied to some parliamentary questions on the subject: "All advertisements and claims for these proprietary drugs are considered by the committee and would not be approved if they were wildly extravagant." Control is thus exercised over the advertisement of medicaments on television, and the criteria relating specifically to medical products are set out in the British Code of Standards, which apply to all advertising to the general public. Their more important provisions may be paraphrased as follows:

No advertisement should (1) contain a claim to cure, (2) offer a product or advice relating to a disease for which the patient should rightly receive the attention of a physician, (3) appeal through fear, (4) offer diagnosis or treatment by correspondence, (5) claim that the product could promote virility or prevent premature aging, (6) offer any medicinal product for the purposes of slimming, weight reduction, or figure control, or (7) offer diagnosis or treatment by hypnosis.

In addition, special limitations are imposed on products advertised for the treatment of baldness and hemorrhoids. It is also an offense to advertise a product, outside of technical journals, as a remedy for cancer, tuberculosis, epilepsy, nephritis, cataract, glaucoma, diabetes, locomotor ataxia, paralysis, and venereal diseases, nor may any product be advertised in terms calculated to lead to its use for producing a miscarriage. Television attracts large sums of money for the advertisement of drugs. Much the largest group is aspirin and headache remedies followed by indigestion remedies, laxatives, and cough and cold remedies.

CORRESPONDENCE

DIABETES AND PREGNANCY

To the Editor:—The editorial in THE JOURNAL, Jan. 17, page 258, entitled "Diabetes and Pregnancy" contains the following statement: "A diet for a diabetic-obstetric patient should be given, averaging 30 calories per kilogram of increasing body weight and containing 175 to 250 Gm. of carbohydrate, 2 Gm. of protein per kilogram of body weight, and a sufficient amount of fat to complete the diet." The question concerning protein requirement of the pregnant diabetic merits discussion.

A patient who is in caloric equilibrium requires from 0.5 to 0.7 Gm. of protein per kilogram of body weight to maintain nitrogen equilibrium. The protein must be in a readily assimilable form and must contain the essential amino acids in adequate amounts. To provide an increased margin of safety, it is customary to give 1 Gm. of protein per kilogram of body weight per day. The author of the editorial proposes a protein intake of 2 Gm. per kilogram per day in pregnant diabetics. This, in a patient weighing 60 kg. (132 lb.), would, over a nine-month period, result in an intake of 16 kg. (36 lb.) of protein in excess of the amount necessary to maintain nitrogen equilibrium in a normal person. Is this large amount of protein necessary?

The fetus at term contains 630 Gm. (1.4 lb.) of protein (100 Gm. of nitrogen). The weight of the uterus, which normally is 30 Gm., increases to 1 kg. (2.2 lb.) at term. Since 75% of the uterine muscle is water, the protein increment is only 225 Gm. (0.5 lb.). The total increment of protein in the patient, resulting from the growth of the fetus and enlargement of the uterus, is barely 900 Gm. (2 lb.) There is some retention of protein by the patient, but from the teleologic standpoint, this is not at all essential. An important point is that the growth of the uterus and fetus during the first five months of pregnancy is comparatively negligible. Their combined weight at the end of this period is only 1 kg. in a woman weighing 60 kg. Beginning at the sixth month there is a rapid increase in the rate of growth of the uterus and fetus, which becomes precipitous during the eighth and ninth months.

From the foregoing one may conclude that (1) during the first five months of pregnancy a protein intake of from 1 to 1.2 Gm. per kilogram per day is sufficient and (2) during the last four months of pregnancy an intake of 1.5 Gm. of protein per kilogram of body weight per day will adequately supply the protein needs. Larger amounts of protein may be given but are not essential.

MAX WISHNOFSKY, M.D.
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Brooklyn 7, N. Y.

To the Editor:—Dr. Wishnofsky's points concerning the dietary needs for a diabetic-obstetric patient are well taken. The requirement of protein in the diet of such a patient who has had adequate protein intake before pregnancy is about 1.5 Gm. of protein per kilogram of body weight per day, but larger amounts of protein are given if the patient has not had adequate protein intake to make up for the past deficit. The optimum aim is nearly 2 Gm. of protein per kilogram of body weight to insure that the mother and fetus get sufficient protein and also to prevent possible toxemia. Although the cause of toxemia of pregnancy is conjectural, it is believed by various investigators that a high-protein, well-balanced diet acts as a preventive of toxemia of pregnancy. Many pregnant diabetic women are on a low-protein-intake diet because of the high cost of a high-protein diet. Others find it difficult to ingest 2 Gm. of protein per kilogram of body weight per day. A good nutritionist can be of aid in this connection.

HARRY BLOTNER, M.D.
314 Commonwealth Ave.
Boston 15.

DATA ON BLOOD DONORS WANTED

To the Editor:—I am interested in securing blood samples from donors who are suspected of being carriers of viral hepatitis. In our laboratory, we wish to run a battery of liver function tests on these samples and hope to obtain more information on the number of suspected carriers who show abnormal results in these tests. We wish to study donors whose recipients have acquired viral hepatitis after transfusion, but only in those cases in which a single transfusion was given. Thus, we are interested only in so-called single donors. Drs. John Neefe and John G. Reinhold and I, with a number of our younger associates, have been interested in the problem of rejecting donors for transfusion who are potential carriers of viral hepatitis. Two of our papers were published in THE JOURNAL, one in the March 27, 1954, issue and one in the March 31, 1956, issue. Physicians knowing of cases of viral hepatitis occurring after a single transfusion are requested to write me for more precise information on submitting a serum specimen and clinical data on the blood donor for our evaluation.

ROBERT F. NORRIS, M.D.
University of Pennsylvania
Pepper Laboratory of Clinical Medicine
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MISCELLANY

THE MEDICAL TECHNOLOGIST AND THE DOCTOR

Robert B. Robins, M.D., Camden, Ark.

As a practicing physician I have an interest in the work of medical technologists and the other professional and technical personnel who assist me and my colleagues in daily practice. I know from experience how important their services are to the teamwork necessary for modern medical care.

As a member of the Board of Trustees of the American Medical Association I also have an interest from the organizational point of view. The A. M. A. has an important committee now studying all phases of the problem of promoting cooperation and rapport between the medical profession and persons in the so-called paramedical areas. That committee, in a progress report at the Clinical Meeting in Minneapolis last December, described this as "one of the most complex problems on the American medical scene today." The committee pointed out that more than 60 groups are functioning in the ancillary or paramedical areas.

You gain a perspective on the complexity of this subject by looking at the growth and development which have taken place in the field of medical technology. In the early days of the clinical laboratory the pathologist was just beginning to be recognized as a necessary medical specialist, and he performed his own laboratory tests. As laboratory medicine developed, pathologists found they needed help; so they began to train assistants to perform the simpler tests. The profession of medical technology was born around the time of World War I.

In those early days the few commercial schools that were established offered training that was inadequate, and their fees were sometimes exorbitant. Realizing that laboratory medicine was developing rapidly and that something must be done to standardize the training of laboratory assistants, the American Society of Clinical Pathologists in 1928 established the Registry of Medical Technologists.

This registry has become recognized by leading medical and hospital groups as the only authoritative qualifying body in the field. It has developed the status of the medical laboratory worker to a high professional level by raising the educational requirements and broadening and improving the technical training. The requirements established by the registry are recognized by such medical organizations as the American Medical Association, the American College of Surgeons, the American College of Physicians, the American Hospital Association, the Catholic Hospital Association, and by other pathologists, physicians, and hospital superintendents. Those requirements also are strongly emphasized by the American Society of Medical Technologists in its career guidance publications directed toward young people planning to enter this field.

In their periodic visits to hospitals staff representatives of the American College of Surgeons, the American Hospital Association, and the American Medical Association—who also are field representatives of the Joint Commission on Accreditation of Hospitals—carefully observe whether workers in the clinical laboratories have registry certificates. The registry, therefore, while purely voluntary and noncoercive, is universally accepted as the recognized authority for qualifying medical technologists in the United States.

In the past few years there has been great progress in the development of new laboratory aids to help the doctor in providing the patient with the best medical care, and year by year techniques have become more complex and specialized. To unravel major problems in diagnosis or treatment physicians today frequently seek the help of biochemists, biophysicists, bacteriologists, histochemists, experts in isotope techniques, and others. The doctor, of course, cannot be expected to master all the testing techniques, so he must depend on technicians and pathologists for help.

The entire March, 1959, issue of *Medical Clinics of North America* was devoted to a symposium on the rationale and clinical interpretation of laboratory tests. The subjects covered included practical tests of gastrointestinal function, liver function, pancreatic function, pulmonary function, kidney function, and thyroid function; tests for clotting disorders, leukemia, and diabetes; and other subjects, including a variety of recently developed laboratory procedures.

The field of medical technology, like the medical profession itself, has become so complex that the registry now issues several different types of certificates, in addition to the general certification which has been given for many years. For example, there is the specialist certification, as well as differ-

Read before the Louisiana State Society of Medical Technologists, Monroe, La., April 17, 1959.

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ent kinds of certificates in histological technique, chemistry, microbiology, blood banking, and exfoliative cytology.

Through the years, with all these technical developments unfolding at an accelerated pace, medical technologists have worked constantly to improve their standards and qualifications. They have done this without any kind of governmental compulsion, control, or licensure—national, state, or local. In fact, one of the brightest spots in the entire paramedical picture is the excellent cooperation which has long existed among the American Medical Association, the American Society of Clinical Pathologists, that society's Board of Schools and Board of Registry, and the American Society of Medical Technologists. These groups have worked closely together in establishing and maintaining high standards of education, technical training, and voluntary registration for medical technologists.

You probably know that the A. M. A. Council on Medical Education and Hospitals acts as the inspection and approval agency for schools of medical technology. By November, 1958, the number of approved schools had increased to 688, with an enrollment of more than 3,000 students. The last annual report of the council showed increases in enrollment and number of graduates which were attributed to the effective recruitment program of the National Committee for Careers in Medical Technology. There now are at least 24,000 registered medical technologists, and there are many who are not registered. The needs of the future will require greater and greater effort. Indicative of the trend is the continuing increase in the number of medical technology schools with college or university affiliations. And effective in January, 1962, the entrance requirement for approved schools will be increased from two to three years of pretechnical college education.

These developments mean that all of us will have to intensify our cooperative efforts to recruit young people with an aptitude for this field, to maintain and constantly improve the standards of education and training, and to promote an ever higher proportion of qualified, registered medical technologists.

While this growth and development has been taking place in the field of medical technology the same thing, in varying degrees, has been happening in other paramedical areas. The medical team has grown in both size and diversity. Working for or with physicians in modern medicine are not only nurses, pharmacists, and medical technologists but also x-ray technicians, occupational therapists, physical therapists, psychiatric social workers, medical record librarians, medical record technicians, and many other types of technical personnel. In addition, there is a large group of persons holding advanced degrees, such as the Ph.D., who are engaged in medical and allied teaching. They also participate directly or indirectly in the care of patients. They are especially active in such preclinical fields as anatomy, biochemistry, microbiology, pharmacology, and physiology.

The best estimate so far is that there are 10 paramedical personnel for each physician. You can see that, from the standpoints of both size and diversity, the problem of promoting closer coordination and higher standards is an enormous one.

Earlier I mentioned an A. M. A. committee that is studying all phases of this subject. Creation of this committee by the Board of Trustees of the American Medical Association reflects a sincere desire to improve the quality of medical care in America by bringing together the too often divergent interests that have evolved during the rapid progress in all fields of medical care. There will be concerted effort to develop an atmosphere in which all will work harmoniously in the best interests of the patient.

Continued advances in medical care and in the art and science of medicine will certainly be in direct relation to the medical profession's ability to understand and work cooperatively with the many disciplines that contribute to the total care of the patient. The precise nature of these future cooperative efforts remains to be determined. Our immediate aim is to gain a broad, over-all view of the various disciplines that are closely related to medicine. Later, there will be more detailed study of particular phases and suggested courses of action.

The House of Delegates of the American Medical Association adopted a resolution in December, 1958, encouraging the voluntary registration of paramedical personnel who assist physicians. At the same time it expressed opposition to the extension of governmental licensure and governmental registration. However, the House requested the committee on paramedical areas to expand its study to include this phase of the problem.

Prominent in the medical profession's thinking is the concept of teamwork and the realization that physicians must offer more active leadership and guidance to ancillary groups. Medical technicians are our fellow workers and our allies in reaching the goal of improved patient care. We want to understand their problems, and we want them to understand ours.

MEDICAL LITERATURE ABSTRACTS

INTERNAL MEDICINE

A Syndrome Developing After Myocardial Infarction. H. P. Groeneveld. Nederl. Tijdschr. geneesk. 103:153-154 (Jan. 24) 1959 (In Dutch) [Amsterdam].

In connection with the case history of a 57-year-old man, who was hospitalized with a diagnosis of heart infarct, the author calls attention to the postmyocardial infarction syndrome which was first described by Dressler in THE JOURNAL (160: 1379 [April 21] 1956). The syndrome is characterized by a combination of pleurisy, pericarditis, and sometimes pulmonary infiltration. The patient presented had had diabetes mellitus for 15 years, and for a period of 6 months preceding the myocardial infarction he had had typical anginal attacks. On examination, pericardial as well as pleural friction rubs could be heard. The left side of the heart was enlarged. The electrocardiogram indicated a posterobasal infarct. The pericardial and pleural friction rubs as well as the cardiac enlargement persisted for a considerable period, but the course was favorable. The patient was treated with insulin and anticoagulants, and was discharged from the hospital after 9 weeks. The author feels that the postmyocardial infarction syndrome is not rare, and that it should be thought of, when there are symptoms suggestive of the extension of the heart infarct, cardiac enlargement, and pulmonary infarct. Dressler found prednisone therapeutically effective but did not employ anticoagulants.

The Low-Salt Syndromes in Congestive Heart Failure. A. Vogl. Am. J. Cardiol. 3:192-198 (Feb.) 1959 [New York].

The author summarizes the current concept of the "low-salt syndromes" and their management in patients with congestive heart failure as follows. The low-salt syndrome is not an entity either clinically or biochemically but represents a group of loosely related disorders. The two main types are (1) an acute or subacute form which develops during intensive diuretic treatment and (2) a chronic form which evidently cannot be attributed to excessive diuresis, since the finding of a low concentration of sodium and chloride in the serum can connote either electrolyte loss or water retention. The differentiation between these two states is made largely on clinical grounds. In most patients there is probably a combination of both factors. The principles of management are different for the depletion types (hypochloremic acidosis and hyponatremia) and the dilution types (lowering of the serum sodium concentration due to dilution of the sodium in the extracellular fluid), but in a given patient treatment remains largely empirical and must be guided by clinical as well as laboratory observation. Correction of the altered electrolyte concentrations is more likely to be achieved if treatment is not limited to appropriate administration of sodium and chloride, but includes the restriction of fluid intake and the concurrent administration of potassium.

The iatrogenic production of a "low-salt syndrome" is not an inevitable risk whenever a low-salt diet and potent diuretics are employed. It can, by and large, be avoided if treatment is individualized, and if the effect of the diuretic procedures is critically evaluated from day to day. Practical treatment principles are presented.

Treatment of Hypertension in the Ambulatory Patient. J. H. Moyer and J. Beem. Am. J. Cardiol. 3:199-213 (Feb.) 1959 [New York].

The authors report observations on 129 unselected patients with diastolic hypertension of all grades of severity, who were studied at the hypertension outpatient clinic of the Hahnemann Hospital in Philadelphia. Blood pressure elevation of adequate severity and for a prolonged period of time will definitely produce vascular changes in the brain, the heart, and the kidneys. Effective reduction of blood pressure may completely arrest these vascular changes regardless of the method used for the reduction of blood pressure. Although the changes may be arrested, renal function rarely returns to normal. Hypertension aggravates and hastens the development of arteriosclerosis. Reducing the blood pressure arrests this hastening process, but still arteriosclerosis progresses, just as it does in the normotensive person. The method used for the reduction of blood pressure is prob-

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The place of publication of the periodicals appears in brackets preceding each abstract.

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ably not important, insofar as arresting the vascular changes associated with hypertension is concerned. The important thing is that the blood pressure be reduced effectively. This the surgeon can do, particularly when he employs concurrent medical therapy. The authors would concur with this approach, just as long as the blood pressure is severe enough to warrant surgical therapy and the surgeon is proficient at performing sympathectomies. On the other hand, when the psychiatrist or the general practitioner or the internist, who carries psychiatric overtones, can "talk the blood pressure down," this is to be considered good therapy. The authors, being neither psychiatrists nor surgeons, prefer to use drugs, and their own results with psychotherapy (and placebo) have been poor.

A multipronged approach is outlined, based on the severity of the hypertensive disease. Mild hypertension can be controlled with chlorothiazide, given to deplete body sodium by increasing its excretion. The administration of this drug may be continued indefinitely as a background medication for all antihypertensive drugs. This is probably the most effective measure for the reduction of blood pressure. Then the sympathetic nervous system is blocked by various methods. The centrally acting drugs are used first. The commonest ones are rauwolfia and hydralazine. Usually in milder cases rauwolfia may be given an initial trial alone, and if the patient needs additional therapy, he may receive hydralazine (Apresoline). In patients with moderately severe hypertension, hydralazine combined with rauwolfia may be given a therapeutic trial.

For patients with more severe hypertension, when the diastolic blood pressure is fixed above 120 to 130 mm. Hg, the use of glanglionic blocking agents, such as mecamylamine or pentolinium, is indicated. Of 31 patients with malignant hypertension, 13 were treated and 18 were untreated. Seventeen of the latter group have died, while of the treated patients 11 are living and 2 are dead. Eleven of the 18 untreated patients died of renal failure and uremia. Treatment of patients with malignant hypertension has completely altered the cause of death, and, when treatment was started as long as the blood urea nitrogen level was normal, patients rarely died of renal failure. The cause of death in treated patients usually was a cerebrovascular accident or a coronary occlusion.

Digitalis and Atrial Tachycardia with Block: A Year's Experience. B. Lown, F. Marcus and H. D. Levine. New England J. Med. 260:301-309 (Feb. 12) 1959 [Boston].

Although numerous recent reports emphasize the increasing frequency of digitalis poisoning, there is as yet little appreciation of the digitalis-induced atrial arrhythmias, the prototype of which is paroxysmal atrial tachycardia with block. The present report is based upon an examination of episodes of paroxysmal atrial tachycardia with block studied at the time of their occurrence in 1957 at the Peter Bent Brigham Hospital, Boston. Thirty-two episodes of paroxysmal atrial tachycardia with block were diagnosed in 23 patients. The criteria for the diagnosis were as follows: an atrial rate usually between 150 and 200; a demonstrable change in the morphology of the P wave; an isoelectric baseline between consecutive complexes in all leads; and the presence of atrioventricular block, either spontaneous or induced by carotid sinus pressure or other vagal maneuvers. The role of digitalis was established on the basis of the clinical circumstances chronologically related to the onset and cessation of the arrhythmia. Digitalis was considered to be the cause (1) if the arrhythmia developed during digitalization or after an increase in maintenance dosage and was abolished by withdrawal of the drug; (2) if the arrhythmia occurred in a digitalized patient immediately after a mercurial-induced diuresis with a substantial weight loss; (3) if the arrhythmia appeared after an event known to enhance digitalis effect, such as potassium loss induced by vomiting, diarrhea, or hemodialysis; (4) if subjective and objective signs of digitalis overdosage appeared with the onset of paroxysmal atrial tachycardia with block and disappeared when the drug was withdrawn.

Twenty-four of the 32 episodes of paroxysmal atrial tachycardia with block were due to digitalis intoxication. In 4 of the 24 episodes simply the discontinuance of digitalis and of diuretic measures restored a normal mechanism. In 2, the administration of digitalis was continued; both patients died. In the remaining 18, measures in addition to stopping digitalis were required: Five episodes were controlled by the oral or intravenous use of potassium; in 10 reversion was achieved by the combined use of potassium and procainamide; and 3 were controlled by procainamide alone. It appears mandatory to stop digitalis and suspend the use of diuretics until a normal mechanism is established. During the past 5 years there has been no reduction in the incidence of paroxysmal atrial tachycardia with block at the Peter Bent Brigham Hospital. The continuing high incidence of this and other manifestations of digitalis intoxication is due to a number of factors. There is no method that permits prediction of optimal digitalis requirements; digitalization, therefore, is frequently carried either overtly or inadvertently to a toxic endpoint. The state of digitalization, like all biological phenomena, is not static. An adequate maintenance dose at one time may prove inadequate or excessive at a later period. Furthermore, the margin

between a therapeutic and a toxic dose narrows with advancing age and increasing heart failure. Lastly, there is an increasing dependence upon electrolyte manipulation in the management of patients with heart failure. Losses of potassium that may attend such measures predispose to intoxication.

Routine Blood Control and Prevention of Medicamental Hemopathies. T. K. With. Ugesk. læger 121:77-81 (Jan. 15) 1959 (In Danish) [Copenhagen].

Routine blood cell counts are of doubtful value in the prevention and early diagnosis of granulocytopenia induced by drugs and can at best be an adjuvant to clinical control. Clinical control consists in impressing on the patient at every consultation the risk involved in taking the drug in question and the paramount importance of immediate withdrawal of the drug and immediate contact with the physician for blood control in case of malaise, fever, sore throat, or sudden exanthem. The blood control must include both leukocyte and differential counts. Normal values in case of clinically alarming symptoms do not exclude a developing granulocytopenia. On normal values the count should be repeated daily for a week or until the symptoms have disappeared. The control must be maintained for the first 2 weeks after withdrawal of the medicament.

SURGERY

Multiple Simultaneous Complications of Peptic Ulcer. S. W. Moore and F. W. Fuller. Am. J. Surg. 97:184-190 (Feb.) 1959 [New York].

Between Jan. 1, 1940, and March 1, 1957, there were 989 admissions to the surgical wards of the New York Hospital for perforated, bleeding, or obstructed peptic ulcer. This group consisted of 775 different patients. Of the 989 admissions, 89 (9.2%) represented 82 different patients with a combination of 2 or 3 complications. The remaining 880 admissions represented 693 patients with only a single perforation, hemorrhage, or obstruction. In the entire study there were 152 patients with perforation, 678 with hemorrhage, and 233 with obstruction. In the group with multiple complications, there were 32 with perforation, 74 with hemorrhage, and 77 with obstruction. Thus, 21% of all patients with perforation had concurrently 1 or 2 other complications, as did 11% of all with hemorrhage, and 33% of all with obstruction. Fifteen of the 82 patients in the multiple entity group died, representing a mortality rate of 17% of 89 admissions in this group. Thirty-six of the 693 patients in the single entity group died, representing a mortality rate of 4% of the 880 admissions in this group. These findings showed that nearly 10% of the patients had more than one of the 3 complications (perforation, hemorrhage, and obstruction), and that such combinations produced a mortality 4 times as great as among patients with only one such complication.

There was a strong association of severe unrelated diseases, especially malignant tumors, in the multiple entity group. Twenty-one (over 25%) of the 82 patients were thus affected. That these associated lesions are often in an early and previously undiagnosed state at the time of the admission for the combined complications suggests that they may serve to exacerbate an existing ulcer tendency and that a severely complicated peptic ulcer may indeed be an early warning signal of their presence. A vigorous examination, especially for pulmonary disease, is indicated in every patient surviving combined complications of peptic ulcer. The triple combination of perforation, hemorrhage, and obstruction is much more common than previously believed, having occurred in 5 of the 82 patients with multiple complications.

The high mortality rate among patients with combined perforation and hemorrhage, when the hemorrhage is massive, was again confirmed. A search for multiple ulcers in the stomach and duodenum should be made whenever the operation of plication is done in a case of perforation, and primary gastric resection should be strongly considered if they are found. Simple gastroenterostomy, gastroenterostomy with vagotomy, or primary gastric resection should be performed for an obstructed perforated ulcer. Such an ulcer usually involves both the anterior and the posterior pyloric walls and makes more likely the occurrence of a massive postoperative hemorrhage as well as dehydration and electrolyte imbalance from pyloric obstruction, unless the additional procedure is performed. When actually confronted with a massive hemorrhage occurring near the time of perforation, the surgeon may be powerless because of the desperate general condition of the patient. Vigorous blood replacement coupled with immediate gastric resection usually offers the only hope for survival. The occurrence of multiple combined complications is a positive indication of advanced, intractable ulcer disease requiring definitive surgical treatment, usually gastric resection, at the earliest possible moment.

Acute Cholecystitis. J. J. Byrne. Am. J. Surg. 97: 156-172 (Feb.) 1959 [New York].

The author presents a pathological and clinical review of 82 women and 52 men, between the ages of 24 and 91 years, with acute gallbladder disease, who were admitted to the surgical service of the Boston City Hospital. Microscopic examination of 75 pathological specimens obtained from these patients provided good evidence that gallbladders may be easily operated on within the first 10 days of an acute attack, and that the earlier this operation is performed, the less chance there is for subsequent

perforations by either gangrene or infection. An additional consideration favoring early operation may be the prevention of an occasional case of septicemia due to Escherichia coli, which has an ominous significance. Most of the complications of gallbladder disease, such as perforation, gangrene, or empyema, and 15 of the 16 deaths, occurred in patients over 60 years of age or in patients with associated disease. A more vigorous approach must be planned for this group. The possibility of acute cholecystitis must be stressed in all patients with known biliary disease who enter a hospital for medical or surgical treatment of unrelated diseases. This may help to explain an occasional difficult diagnostic syndrome, once therapy for unrelated disease, such as pernicious anemia, leukemia, diarrhea, pulmonary emphysema, and asthma, is begun.

There was poor correlation between signs and symptoms and the state of an acutely diseased gallbladder. Consequently a watchful conservative approach of waiting and observing may actually be careless waiting and blind guessing. Laboratory aids are of some value, especially if correlated with the patient's age and associated vascular disease. Of particular significance is an elevated diaphragm on the right side, since, when it is present, it is associated with complicated disease of the gallbladder in a high percentage of patients. The differential diagnosis should carefully rule out hepatitis, heart disease, pneumonia, pancreatitis, and pyelonephritis.

The preferred operation is cholecystectomy, with cholecystostomy reserved for patients in poor general condition or for those in whom the pathological findings are too severe. Unless there are definite positive indications, exploration of the common bile duct is not advised, particularly in patients with associated vascular diseases. The over-all mortality rate was 12% and varied with the condition of the gallbladder and the physical status of the patient. Early operation may control the condition of the gallbladder. Sufficient time must be taken before surgical intervention to improve the physical status of the patient.

Carcinoma of the Esophagus and Cardia: Results of Treatment, 1946 to 1956. F. H. Ellis, Jr., R. C. Jackson, J. T. Krueger and others. New England J. Med. 260:351-358 (Feb. 19) 1959 [Boston].

Resective surgery for carcinoma of the esophagus and cardia can now be carried out with a reasonably low mortality. Opinion differs, however, as to whether this form of treatment affords the patient sufficient relief of symptoms and prolongation of life to justify the risk and discomfort of a major operative procedure. This prompted the authors to study 909 patients with carcinoma of the esophagus and cardia admitted to the Mayo Clinic between January, 1946, and January, 1956. Most of the patients were between the ages of 50 and 69 years. The patients were divided into 2 groups, those seen in the 5-year period from 1946 through 1950 and those seen in the 5-year period from 1951 through 1955. Surgical exploration was carried out in 414 (45.6%) of the 909 patients; of these, 245 (27%) underwent resection. Forty-eight (11.6%) of the 414 patients who were subjected to operation died at the hospital, 39 (15.9%) of them dying after resection. Comparison of the experience gained in the two 5-year periods revealed a significantly lower mortality and higher resectability during 1951-1955. An increase in the number of resections carried out on patients with carcinoma of the lower portion of the esophagus or carcinoma involving the esophagogastric junction accounted for the increased resectability rate. The mortality from exploration remained low in both periods. The over-all 5-year survival rate among the 117 patients surviving the resection itself was 17.2%. Squamous-cell carcinomas of the lower part of the esophagus and the esophagogastric junction have the best prognosis, and carcinomas of the upper half of the esophagus and adenocarcinomas involving the esophagogastric junction have the worst prognosis. Radiation therapy did not favorably affect the survival of patients in whom resection was not done, with the possible exception of those with lesions in the cervical portion and the upper half of the esophagus.

In spite of the admittedly low 5-year survival rate of 3.9% of all patients seen during the two 5-year periods, analysis of the data presented seems hopeful in some respect. A considerable reduction in mortality can be achieved by the elimination of the high number of anastomotic leaks, which caused 50% of the total deaths in this series. Furthermore, effective palliation can only be achieved if the resectability rate is increased. The mortality from exploration is low enough to warrant exploration in a greater number of patients in the hope of effecting palliative or even curative resections in more patients. It is doubtful whether better survival rates can be achieved for lesions located in the upper half of the esophagus or for adenocarcinomas of the cardia. It is, therefore, suggested that palliative resection for lesions of the latter type be employed when feasible. It must be remembered, however, that the ultimate rate of cure of carcinoma of the esophagus will probably always be low. Proper selection of patients for an aggressive surgical attack, as well as a reduction in mortality, will place the surgical approach to this lesion on a sounder basis. Modern techniques that make use of supervoltage radiation therapy may well prove to be effective in the palliative treatment of lesions in cases in which available clinical data contraindicate the use of surgical measures.

QUESTIONS AND ANSWERS

UTERINE SUSPENSION

To the Editor:—*Some hospital staff men question the justification of performing uterine suspensions not per se but rather as a procedure associated with other conditions. Some believe that uterine suspension is indicated and justified in patients in whom relative sterility is associated with the loss of the pregnancy one or more times if there is persistent retroversion of the uterus. If uterine suspension is ever justified, what are the indications?* *W. G. Thompson, M.D., Millvale, Pa.*

Answer.—Carter and co-workers (*J. A. M. A.* 148:995-1002 [Mar. 22] 1952) in a study of 500 couples originally examined for infertility found a decreased incidence of pregnancy in wives who had undergone certain gynecologic operations. Wives with similar gynecologic conditions on whom no operation had been performed showed no such decrease. They believed that in the infertile patient suspension was rarely justified because it did not increase the incidence of pregnancy. The operation does not prevent miscarriage. The finding of a retroverted uterus is not an indication for this operation. When a pelvic operation is performed for proved endometriosis it is often the practice to include some form of uterine suspension. In the performance of tuboplasty, the uterus might be suspended as an aid in preventing postoperative complications. In visits around the United States one is rather surprised to see a uterine suspension scheduled, but the frequency with which the operation is still performed is diminishing.

YELLOW JACKET STING

To the Editor:—*In August, 1958, a patient had to be hospitalized with an almost fatal reaction from a yellow jacket sting. Is there any desensitizing agent that this patient could use?*

Rembert Bayne, M.D., Selma, Ala.

Answer.—Desensitization has been attempted in some related venom exposures, but the results have not been satisfactory. Immunization may be accomplished up to a certain point but does not last long enough to be an effective preventive for trouble from a later exposure. This consultant's experience has been with the treatment of the acute stage. In some instances the reaction has been severe and is in the nature of an anaphylactic shock. In such patients the most effective remedy seems to be subcutaneous injection of a 1:1,000 solution of epinephrine in a dose of up to 1 cc. (according to the age of the patient). This may be repeated if required. Calcium lactate or gluconate in a 10% solution, administered intravenously, up to 10 cc., has been used with success. These patients may be treated locally with applications of a paste made from sodium bicarbonate or a dressing moistened with dilute ammonia solution. If these are not quickly available, laundry soap may be used. These local applications often relieve symptoms, inasmuch as the venom in all these insect stings seems to be acid.

HYPOTHYROIDISM AND ARTHRITIS

To the Editor:—*A dentist has said that sore gums under dentures are frequently caused by a lack of mucin in the saliva. This condition is found in hypothyroidism and is corrected by giving thyroid extract. Could a similar lack of mucin in synovial fluid promote arthritis? It is said that years ago thyroid extract was used in the treatment of arthritis.*

J. F. Edward, M.D., Winnipeg, Canada.

Answer.—There is no evidence of a causal relationship between hypothyroidism and arthritis. In some situations where a low metabolic rate is encountered, desiccated thyroid has been given on an entirely empiric basis in the past. The assumption that a lack of mucin in the synovial fluid could promote arthritis does not appear to be a valid concept from an endocrine standpoint.

BONE GLUE

To the Editor:—*Are there any reliable data on the use of a bone glue in the restoration of bone continuity in poorly healed fractures of the middle third of the humerus? A 42-year-old man had a tibial graft for an old fracture of the humerus, but it failed to take. Would bone glue be indicated in such a case?*

John K. Griffith, M.D., Valley Falls, Kan.

Answer.—Reliable data on use of a bone glue can be found in the Aug. 25, 1958, issue of *Medical Science* and in *Surgical Forum*, vol. 9, 1959, page 762. An article also appears in the April, 1959, issue of the *American Journal of Surgery*, outlining some of the clinical results. The substance used is called Ostamer and is being supplied for clinical investigation by the Wm. S. Merrell Co., Cincinnati 15.

The answers here published have been prepared by competent authorities. They do not, however, represent the opinions of any medical or other organization unless specifically so stated in the reply. Anonymous communications cannot be answered. Every letter must contain the writer's name and address, but these will be omitted on request.